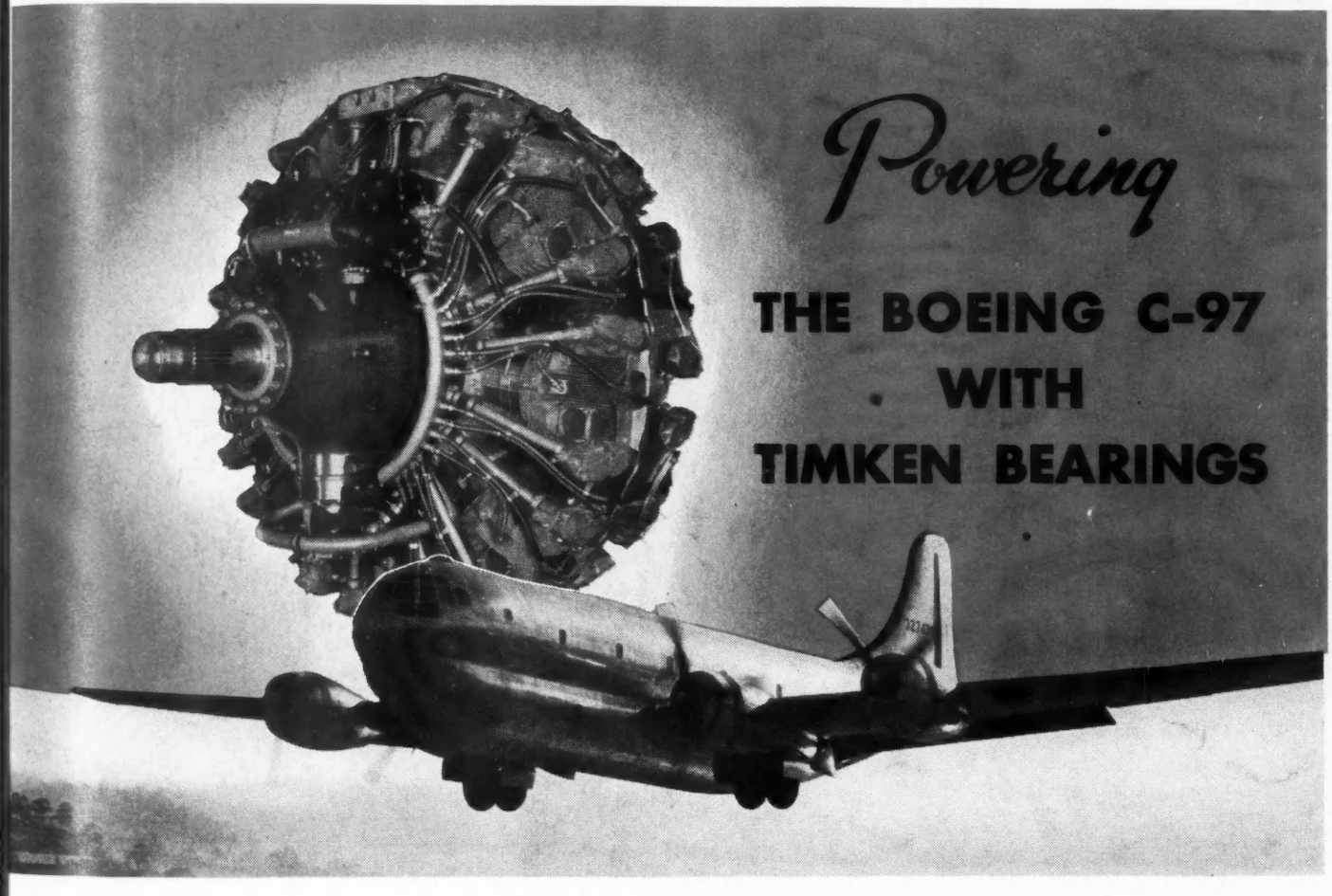
ERING
RARY

JUL 1 1 1945

AUTOMOTIVE and Aviation INDUSTRIES

JUNE 15, 1945



Powering

THE BOEING C-97 WITH TIMKEN BEARINGS

Seventy-two Timken Bearings in four Wright Cyclone 18 engines help power the mighty Boeing C-97, new transport counterpart of the Boeing B-29 which exceeds all Army Air Force transports in range, payload and size. 110 ft. 4 in. long, and with a wingspread of 141 ft. 3 in. the giant ship must be able to carry 100 fully equipped troops, must have from its engines all the endurance and great power to which Timken Bearings contribute.

But stamina and strength are not the only quality Timken Roller Bearings impart to aircraft engines. Compactness, light weight, freedom from friction, smooth operation, economy of maintenance — as well as maximum radial and thrust load-carrying capacity are other important qualities.

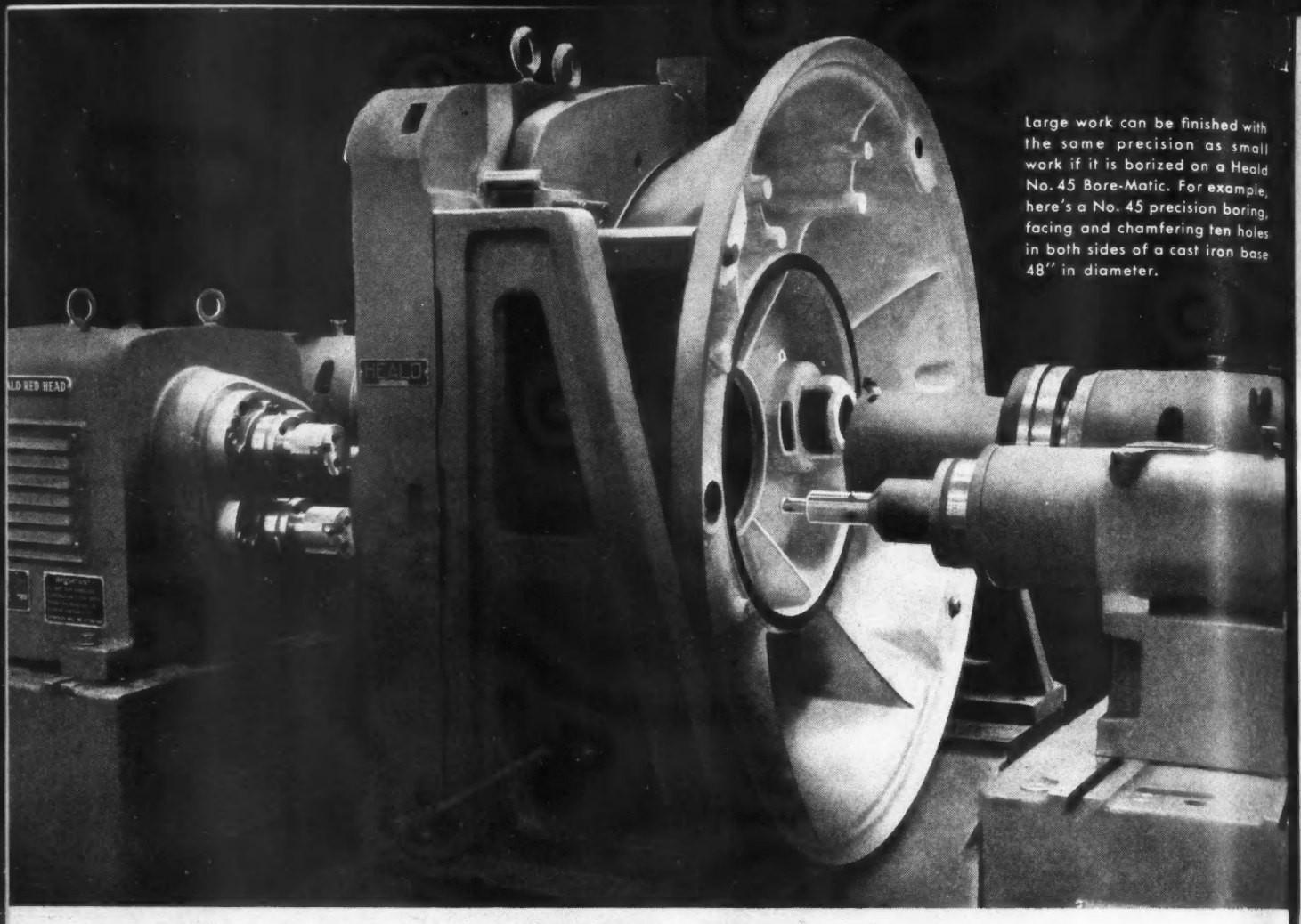
If these indispensable bearing features can help you meet your aircraft requirements, write us. We'll be glad to make recommendations. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

"Be sure the trade-mark "TIMKEN" is stamped on every bearing you use!



Large work can be finished with the same precision as small work if it is borized on a Heald No. 45 Bore-Matic. For example, here's a No. 45 precision boring, facing and chamfering ten holes in both sides of a cast iron base 48" in diameter.

HEAVYWEIGHT *with a Feather Touch...*

Get High Precision On Your Large Work With This Heald No. 45 Bore-Matic

13,000 lbs. of "heavyweight" machine tool... that's a lot of mass, a lot of rigidity, and gives some indication of the size and ruggedness of the Heald No. 45 Bore-Matic. Built specifically for large, heavy awkward parts, the No. 45 is *big* but still incorporates all the proven features of Bore-Matic construction for "feather-touch" high precision borizing.

Holes up to approximately 9" I. D. can be bored. Center-to-center distance of borized surfaces to 31" is possible. Double-end No. 45's provide standard maximum table stroke of 30", single-end machines 16". Table pads have ample area to accommodate work fixtures or tooling—36"x 40" on the Double End machine; and 36"x 36" on the Single End. Distance between bridges on the Double End is 52".

This big, massive Bore-Matic is available in either single or double end types. The two types are built low, tables being only 22" from the floor at conveyor level, to facilitate handling of heavy, awkward work. For further details, write today to:

THE HEALD MACHINE COMPANY
WORCESTER 6, MASS.

More Precision • Less Cost... **HEALD**

ERNAL AND SURFACE GRINDING MACHINES • BORE-MATIC PRECISION FINISHING MACHINES

AUTOMOTIVE and Aviation INDUSTRIES

Published Semi-Monthly

Volume 92 June 15, 1945 Number 12

JULIAN CHASE, Directing Editor
J. R. CUSTER, Associate Editor JOS. GESCHELIN, Detroit Editor
JEROME H. FARRIS, Ass't Editor LEONARD WESTRATE, News Editor, Detroit
MARCUS AINSWORTH, Statistician H. H. ROBERTS, Ass't Editor
L. W. MOFFETT, Washington Editor HOWARD KOHLBRENNER, Art Editor
DAVID J. ANSBORO, JR., Washington News Ed. R. RAYMOND KAY, West Coast
EUGENE J. HARDY, Washington Ass't Ed. MARCUS W. BOURDON, British

CONTENTS

For Federal Housecleaning. *By Julian Chase* 15

Air Passenger Traffic Expectations. *By Dr. L. C. Sorrell* 17

Studebaker Shot-Peening Technique 19

Curved Glass Windshields. *By J. M. Crone* 20

Novel Design Feature of Fairbanks-Morse Opposed-Piston Engines. *By Philip Ruskin* 22

Ford '46 Super Deluxe and Truck Features 27

Cast Crankshafts. *By Joseph Geschelin* 28

Four British Companies Announce Postwar Models. *By M. W. Bourdon* 32

Design Features of the Lockheed Constellation. *By Clarence L. "Kelly" Johnson* 36

News of the Industry 44

Airbriefs. *By Henry Lowe Brownback* 52

New Production Equipment 60

New Products for Aircraft 70

New Products 78

Advertisers' Index 220

Copyright 1945 by Chilton Company (Inc.)

Automotive Division
Jos. S. HILDRETH, President and Manager
JULIAN CHASE, Vice Pres. G. C. BUZBY, Vice Pres.

OFFICES

Philadelphia 39, Pa., Chestnut & 56th Sts., Phone Sherwood 1424
New York 17, N. Y., 100 East 42nd St., Phone Murray Hill 5-8600;
Chicago 1, Ill., Room 916, London Guarantee & Accident Building, Phone Franklin 4243; Detroit 2, Mich., 1015 Stephenson Bldg., Phone Madison 2090; Cleveland 14, Ohio, 1030 Guardian Bldg., Phone Cherry 4188; Washington 4, D. C., 1061 National Press Bldg., Phone District 8109 and 8110;
San Francisco 5, Calif., 605 Market St., Room 708, Phone Douglas 0967;
Los Angeles 1, Calif., 6000 Miramonte Blvd., Phone Lafayette 5525.

Cable Address ..... Autoland, Philadelphia

Member of the Audit Bureau of Circulations
Member Associated Business Papers, Inc.

AUTOMOTIVE *and* AVIATION INDUSTRIES is a consolidation of the Automobile (monthly) and the Motor Review (weekly), May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

Owned and Published by
CHILTON COMPANY
(Incorporated)

Executive Offices
Chestnut and 56th Streets, Philadelphia 39, Pa., U.S.A.

Officers and Directors
C. A. MUSSELMAN, *President*
Vice-Presidents
JOS. S. HILDRETH GEORGE H. GRIFFITHS EVERIT B. TERHUNE
J. H. VAN DEVENTER C. S. BAUR P. M. FAHRENDORF
WILLIAM A. BARBER, *Treasurer* JOHN BLAIR MOFFETT, *Secretary*
JULIAN CHASE THOMAS L. KANE G. C. BUZBY
HARRY V. DUFFY CHARLES J. HEALE

WILLIAM H. VALLAR, *Asst. Treas.*

PUTTING AN OIL COOLER *to Work*

Young Oil Temperature Regulator . . . specially developed to keep engine oil at proper temperature, automatically.

• ACTION . . . fast and dependable . . . that's what's required of equipment which must keep pace with the stern demands of the sensational "Thunderbolt." Hordes of these superb fighting ships will be treating the Japs to the same medicine that made the Nazis yell "uncle." Right along with each one will go a Young Aircraft Oil Temperature Regulator, proudly cutting warm-up time and providing the urgently needed anti-congealing characteristics for high altitude operation. Fast company? Yes, but Young is used to it, pioneering in the building of better heat transfer equipment. Whatever your aeronautical heat transfer requirements or problems, Young Engineers stand ready to help.

YOUNG

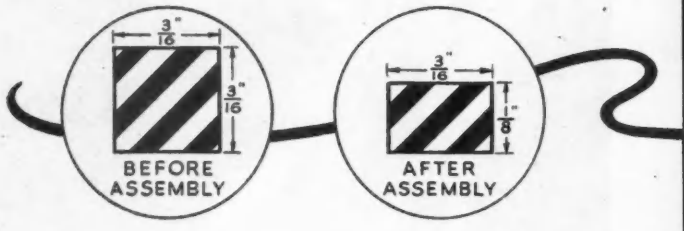
HEAT TRANSFER PRODUCTS

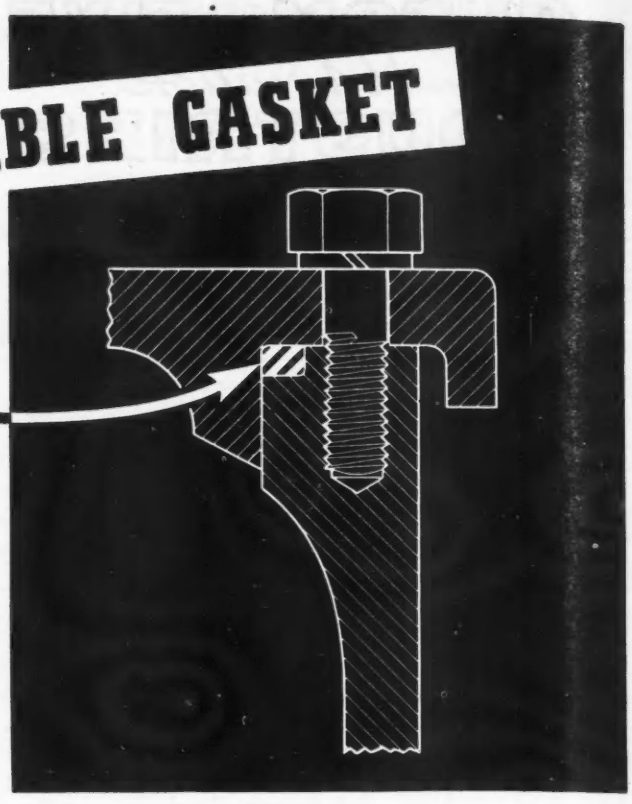
Oil Coolers • Gas, Gasoline, Diesel Engine Cooling Radiators • Intercoolers • Heat Exchangers • Engine Jacket Water Coolers • Unit Heaters • Convectors • Condensers • Evaporators • Air Conditioning Units • Heating Coils • Cooling Coils • and a complete line of Aircraft Heat Transfer Equipment.

YOUNG RADIATOR CO., DEPT. 215-F2, RACINE, WIS., U.S.A.

AUTOMOTIVE *and* AVIATION INDUSTRIES. Vol. 92, No. 12. Published semi-monthly by Chilton Co., Chestnut & 56th Sts., Phila. 39. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, Mexico, United States Possessions, and all Latin-American countries. $1.00 per year. Canadian and Foreign $2.00 per year; single copies, 25 cents, except Statistical Issue (Mar. 15th), 50 cents.

TRULY COMPRESSIBLE GASKET





1. Permits rigid metal-to-metal assembly

2. Seals light hydraulic oil at 200° F.

PERMANENT FLANGE PRESSURE of over 300 lbs. per square inch is maintained by this Armstrong's Cork-and-Synthetic-Rubber Gasket, compressed 33-1/3%. No lateral flow occurs during compression.

TWO successive problems confronted an equipment manufacturer who had to seal light hydraulic oil at 200° F. and, at the same time, maintain an absolutely rigid assembly.

The conventional type of assembly—a gasket bolted between flat flanged surfaces—did not work. No matter how tightly the bolts were pulled down, the joint remained comparatively flexible. A metal-to-metal joint was then designed, using a 3/16" x 3/16" section non-compressible gasket in a 1/4" x 1/8" groove. This, too, proved impractical. Assembly was difficult, and excessive strain caused the non-compressible gasket to age rapidly.

The problem was completely solved with one of Armstrong's truly compressible cork-and-synthetic-rubber compositions. A 3/16" x 3/16" section gasket was made and compressed one third into a 3/16" x 1/8" groove. There was no side flow with this specialized Armstrong material. Its true compressibility and permanent resilience produced a tight, positive seal . . . permitted the metal-to-metal assembly required for absolute rigidity.

In addition to cork-and-synthetic-rubber compositions, Armstrong supplies the automotive and aviation industries with many other types of sealing materials. These include cork compositions, synthetic rubber compounds, fiber sheet packings, and rag felt papers. For specification data on these materials, send for your free copy of "Gaskets, Packings, and Seals." Write, too, for complete facts about any of the Armstrong's specialties listed below. Address Armstrong Cork Company, Gaskets and Packings Dept., 1506 Arch St., Lancaster, Pa.

MATERIALS AND SPECIALTIES FOR AIRCRAFT AND AUTOMOTIVE UNITS

- **Gaskets, packings, seals,** piston cups, bushings, and valve seats—for gauges, fuel lines, meters, hydraulic systems, and other equipment
- **Composition roll goods,** with or without fabric back, plain or adhesive-coated—used as glazing strip, binding tape, cushion pads, anti-skid flooring, and gaskets
- **Tank strap cushions**
- **Sealing materials** for specialized aircraft equipment handling aromatic fuel
- **Felts** for vibration-damping and soundproofing
- **Wingwalk materials**
- **Resilient floorings**
- **Carburetor floats** and other fabricated natural or composition cork specialties

ARMSTRONG CORK COMPANY

AUTOMOTIVE and AVIATION INDUSTRIES

Published on the first and 15th of the month

June 15, 1945
Volume 92, No. 12

For Federal Housecleaning

by Julian Chase

OUTSTANDINGLY deserving of all the support and encouragement that can be given are the efforts of Senator Harry F. Byrd, of Virginia, to cut the cost of Government. As chairman of the Joint Committee on Reduction of Non-Essential Federal Expenditures, he has worked vigorously, consistently and intelligently on that job for more than four years. His undertaking is a task compared with which the cleaning of the Augean stables was a simple operation not worthy of its myth-born fame.

Has the Senator made progress? The correct answer is probably no and yet yes. While measurable results have been achieved in the form of savings here and there, savings that are important because they are savings, though not as great as they might and should have been, the big cuts that are not only possible but vitally necessary are still to be made and much remains to be done before they materialize. But a realization of the crying need for them has been established in many more minds and with it has come a widely spreading and awesome apprehension of the consequences if action fails.

The Government's fiscal condition is one that would mean only ruin to a business enterprise. The Government's functional organization is an incomprehensible mess. By the end of the war, as Senator Byrd has said, the national debt will amount to twice the assessed valuation of all our real estate. "Continued deficits," he added, "hold nothing for us but insolvency and insolvency means dictatorship." The Federal Government, as it is now organized, he pointed out in a recent newspaper article, "is worse than any of the private utility holding companies which it condemned. It is a sprawling, unintegrated mass of departments and bureaus with overlapping functions, operating haphazardly."

When World War I ended, Federal employes numbered 917,760. In September, 1939, there were 940,133 of them who were paid at the rate of $1,598,264,000 a year. In June, 1943, there were 3,008,400 and in March, 1945, 3,443,192. The average annual Federal payroll is now between $6 and $7 billion and there is at present before Congress a bill which, if drastic cuts in personnel are not made, will add another billion to it.

Government corporations grew rapidly in number and independent potency during the New Deal. There are now 44 of them with borrowing power in excess of $33 billion, or more than the entire national debt of not so many years ago. They compete with private industry on a specially favored basis. Relatively they are irresponsible and prolific spenders. U. S. Comptroller General Warren has said, "if the present trend continues . . . we shall soon have government by Govment corporations."

To put a new and effective packing in the faucet through which Government corporations pour out our dollars, the Byrd-Butler Bill has been introduced. Its purposes are to place these corporations in the same category as other departments of Government and to give back to Congress authority over the appropriation of the taxpayers' money.

More power to Senator Byrd in his efforts to put business principles in Government and thus save us from insolvency.

WHAT you gain by having skilled spring engineers design your springs is vividly demonstrated in Adel's "Mighty Midget" Hydraulic Selector Valve. 76% lighter and 72% smaller than previous designs, this unit measures only 1½" x 2½" x 2¼". Considering these dimensions, you can well imagine the tiny size of the Muehlhausen Springs—the nerve center of the "Midget's" operation.

These springs are tiny in size only. Their operating characteristics and the amount of engineering skill that goes into them would cause many a man-size spring to take a back seat. Designed to meet precisely every requirement of the job, these springs were a vital factor in the development of this remarkable valve.

Improvement in product performance and added product life are always assured when using *designed* springs. MUEHLHAUSEN SPRING CORPORATION *(Division of Standard Steel Spring Company)*, 650 Michigan Avenue, Logansport, Indiana.

***To improve product performance, use* MUEHLHAUSEN Designed SPRINGS**

Air Passenger Traffic Expectations

By Dr. L. C. Sorrell
Director of Research,
Air Transport Assoc. of America;
and Professor of Transportation,
Univ. of Chicago

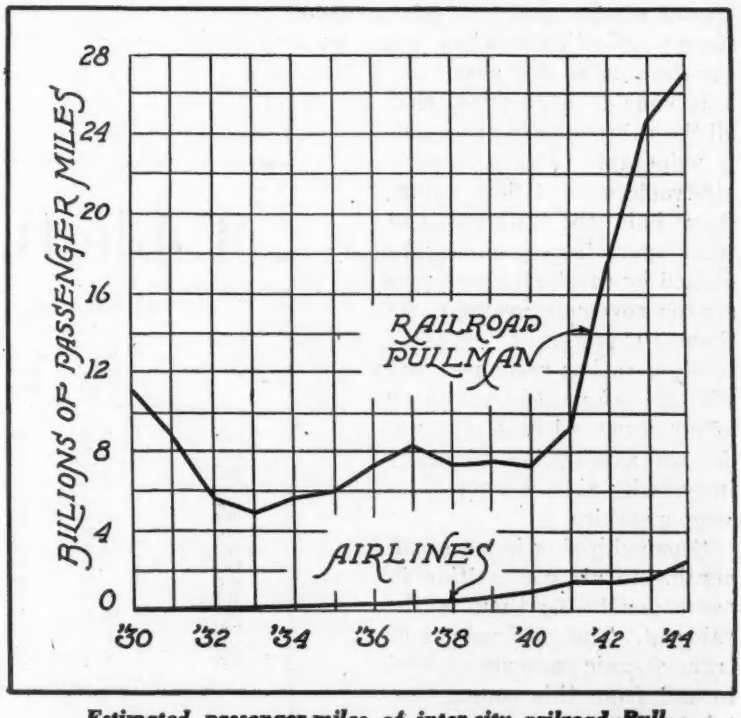
WHAT is a reasonably expectable volume of passenger business which the airlines can capture by 1950? Without saying they will achieve it in that year, what would be a normal goal of effort—something they might reasonably attain by that time?

In the 10 years from 1930 to 1940, airline passenger-miles grew 13 fold; and in the six years from 1935 to 1940, the increase was five times, or at the rate of about 27 per cent per annum. Normally, most transport enterprises exhibit their largest relative growth in their early years; the rate of growth tends to decline as they move on through adolesence to full maturity. It is expectable that the rate of increase in the 1940's would be less than in the 1930's; hardly more than 25 per cent and probably not over 20 per cent per annum. If the war had not intervened, and if air transportation had been able to advance under purely civilian economic conditions, a rate of growth of 20 per cent per annum would by 1950 have carried the industry to some 6.5 billion passenger-miles in 1950; 25 per cent would have produced about 9.7 billions; and 22 per cent would have meant 7.5 billions. Should the airline passenger-mile rates of 1950 reach the expected level of 4c, the expectable passenger revenues of the scheduled airline operators of that year should be in the neighborhood of $260,000,000 to $300,000,000.

It is generally recognized among students of air transportation that the market from which the airlines must seek much, if not most, of their passenger patronage is that which the railroad Pullman car has largely accommodated in the past. The Pullman car as well as the airplane is an essentially long-distance transportation vehicle (see Table I); both are usually regarded as being in the luxury class, though whether luxury really can be predicated of air travel is doubtful. The airline fares are closest to the cost of travel by rail plus Pullman fares. Both contain a large factor of business travel as well as recreational.

Taking the travel for distances of 200 miles or more, the Pullman traffic in this class is regarded as quite amenable to airline persuasion. While some airline forecasters believe that both the rail coach and the inter-city bus may yield some passengers to the air, most do not look upon these classes of travel as yielding much during the years immediately ahead. Both rail coach and inter-city bus lines have fares (see Table II) that are too low for expectable airline rates and costs during the next five years.

Prior to the war, the airlines had diverted some travel from the Pullman car, though the Pullman had



Estimated passenger-miles of inter-city railroad Pullman travel versus airline operations by years.

Excerpts from paper entitled, "Prospective Passenger Traffic, Volume, Rates and Service," by the same author, and delivered recently at the Chicago Forum on Aviation conducted jointly by the Chicago Association of Commerce and the University of Chicago.

Table I. *Percentage distribution and distance pattern of various types of carrier in inter-city passenger traffic.*

	Rail Coach		Rail Pullman		Airlines		Inter-city Bus	
	Passengers	Pass. Miles	Passengers	Pass. Miles	Passengers	Pass. Miles	Passengers	Pass. Miles
1-99 miles	82.0	37.5	16.0	3.5	6.6	1.2	88.0	44.9
100-249 miles	14.9	36.1	46.0	27.0	41.7	15.1	8.6	25.8
250 miles and over	3.0	27.0	38.0	69.0	50.8	83.3	3.4	29.2

lost far more traffic from its 1937 peak than the airlines had gained by 1940 (see chart). It is probable that much travel of this type will take to the air after the war. But whether it means a loss of rail Pullman patronage of 50-75 per cent of that obtained before the war remains questionable; it should not be assumed. It depends, in part, upon the total volume of such long-distance travel by common carriers which will be induced by the prevalence of a level of national income much above that before the war; and, in part, upon the vigor, initiative and ingenuity with which the railroads exploit their own potential capacities for carrying travelers. It is at least possible that the year 1950 may still find as many passenger-miles of travel in Pullman cars as occupied those vehicles before the war, and the volume may approximate that accommodated by the airlines.

Little Competition With Railroads

The railroads are likely to enjoy larger volumes of coach travel after the war than they did before the war. Whether the pullman volumes decline or not, total passenger revenues ought not to be less than in the prewar years and may be even higher. Thus, the impact of the growth of air transport upon rail passenger-and-allied services might be very limited during the coming five years.

It should be observed that all the railroads are not equally vulnerable to the effects of air-traffic competition. More than half the mileage and total operating revenues are earned by carriers whose passenger revenues average less than 10 per cent of their total operating revenues; and who, therefore, will not incur heavy revenue losses even under an assumption of heavy inroads by air transport passenger service.

Ocean shipping is more vulnerable to air competition in passenger traffic than is the railroad. The 1937 volume of trans-oceanic passenger travel to and from this country totaled 1,359,000 passengers, in and out, who traveled an estimated 3.6 billion passenger miles. The class composition of that travel is significant because it is probable that the airlines will find their first markets for development in the first-class passenger field, with some traffic derived from the second-class market. In 1937, the trans-oceanic travel to and from the United States among the classes was as follows:

	Passengers	Passenger-Miles	Revenues
1st and Cabin	309,440	1,087,974,000	$66,094,000
2nd and Tourist	246,350	1,019,606,000	37,840,000
3rd Class	292,798	1,225,777,000	27,405,000
Totals	848,588	3,333,357,000	$131,339,000

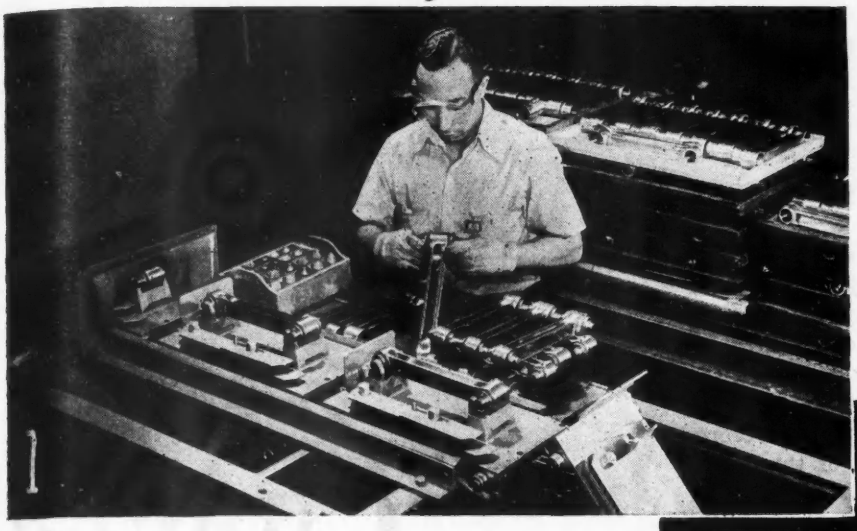
(This table does not include cruise travel, nor that to the Hawaiian Islands, Alaska, and certain nearby islands in the Caribbean.)

Before the war, airline overseas passenger fares averaged rather close to 10c per passenger-mile, and were substantially above first-class steamship fares. It is a reasonable prospect that, after the war, these rates will decline quickly to the level of the first-class steamship rates, and will even break through those rates into the second-class level within a short time. Therefore, the vastly superior speed of the airlines, coupled with rates no higher than the ships have to offer should take a large fraction of the volume of travel of 1937, variously estimated by steamship traffic men at 50-60 per cent, within a short time. And the prospects are good for the development of a type of overseas travel that steamships have not been able to provide; namely, the quick trip for the short vacationist. The immediate postwar years probably will not witness this development because of the necessary restraints on such travel; but, by 1950, this travel

(*Turn to page* 104, *please*)

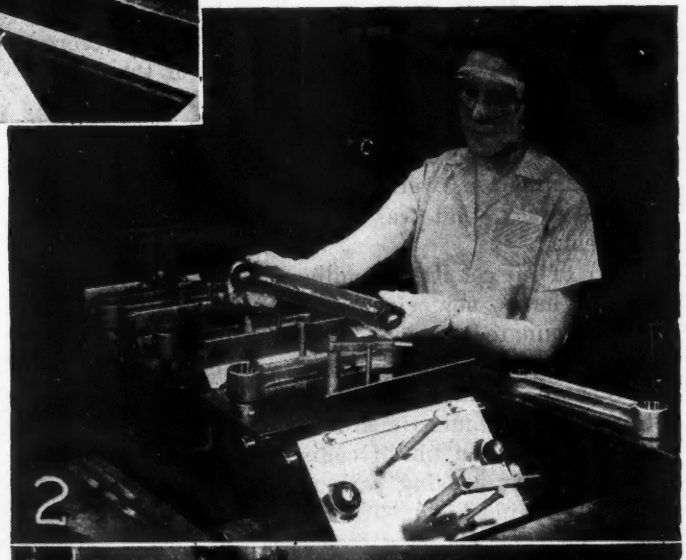
Table II. *Average passenger-mile receipts and average journey for various types of carrier.*

	Inter-city Bus		Rail Coach		Rail Pullman		Pullman	Airlines	
	Pass. Mile Rec.	Average Haul, Miles	Pass. Mile Rec.	Average Haul, Miles	Pass. Mile Rec.	Average Haul, Miles	Pass. Mile Rec.	Pass. Mile Rec.	Average Haul, Miles
	¢		¢		¢		¢	¢	
1930	2.78	14	3.08	....	3.39	....	....	8.3	224
1931	2.71	14	2.89	....	3.20	....	....	8.7	226
1932	2.70	18	2.54	....	2.85	....	....	6.1	288
1933	2.35	21	2.22	....	2.51	....	....	6.1	352
1934	2.00	21	2.09	....	2.25	....	....	5.9	407
1935	1.90	22	2.11	....	2.25	....	....	5.7	420
1936	1.80	20	1.84	....	2.27	....	....	5.7	427
1937	1.70	20	1.71	54.1	2.32	367.1	....	5.6	432
1938	1.75	29	1.86	52.1	2.37	370.6	0.64	5.7	415
1939	1.70	39	1.80	55.6	2.33	379.4	0.65	5.1	400
1940	1.60	34	1.67	60.8	2.30	380.7	0.64	5.1	388
1941	1.50	34	1.64	70.0	2.28	379.4	0.60	5.0	387
1942	1.62	34	1.77	91.5	2.40	420.8	0.55	5.3	454
1943	1.65	32	1.74	112.7	2.39	393.4	0.55	5.3	538
1944	1.65	28	1.70	119.8	2.43	410.3	0.51	5.1	557



1. *First step in shot-peening process fitting bores with plugs to protect them while channels and sides are treated on the belt conveyor running through the peening cabinet.*

2. *Articulated rods just before entering a third shot-peening cabinet. Note that the piece is placed crossways of the belt instead of longitudinally. This step peens the curvature of the rod ends.*

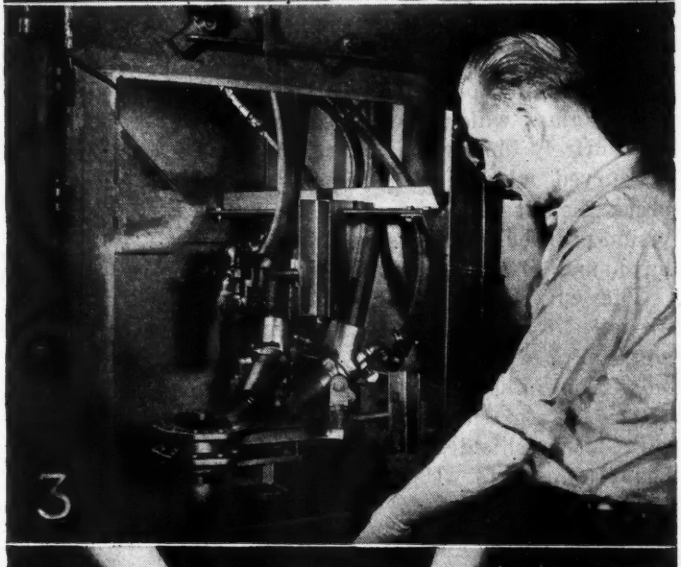


Studebaker Shot-Peening Technique

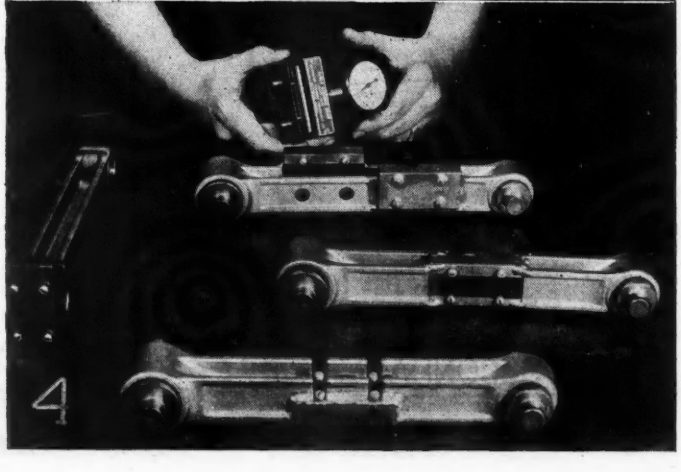
DETAILS of the shot-peening technique adopted by The Studebaker Corp. for improving the fatigue life of highly stressed aircraft engine connecting rods have been released, this advanced manufacturing procedure being in effect in the Studebaker plant at Chicago where parts are produced for Cyclone engines.

According to the announceemnt, Studebaker has gone beyond the initial stage of shot-peening by the introduction of the operation of coating the exposed surfaces with a special corrosion-resisting lacquer. This serves a manifold purpose. In the first place, it provides corrosion resistance during handling of rods on the machine lines and at assembly. In addition, it checks the possibility of corrosion during the first few hours of actual engine operation. This treatment stems from research at Wright Field and

(*Turn to page 96, please*)



3. *Key to the precise control are clusters of double-throated nozzles. Metered shot is fed by gravity down the larger throat. The air blast enters through the second throat. In this cabinet one side of the upper flat surfaces and inside channel surfaces of the master rod are peened while the part rotates slowly.*



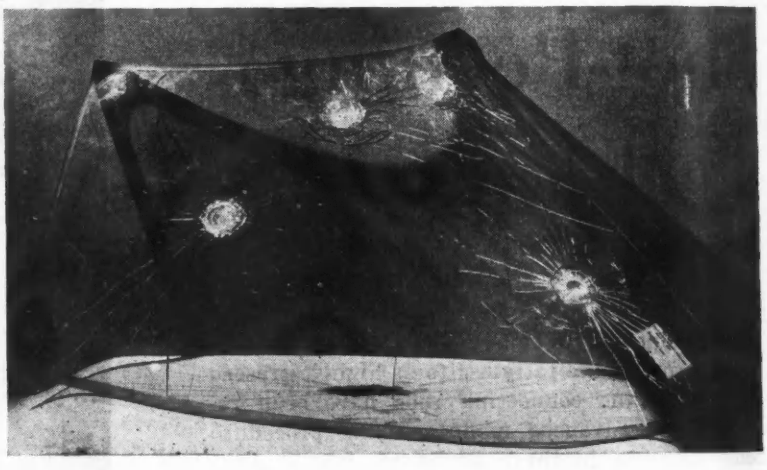
4. *In this photo is shown how the thin metal strips are attached at various locations on the dummy rods for checking the depth of the production shot-peening. The Almen Specimen Gage can be seen at the top of the picture.*

Curved

By J. M. Crone
Design Engineer,
Curtiss-Wright Research Laboratory

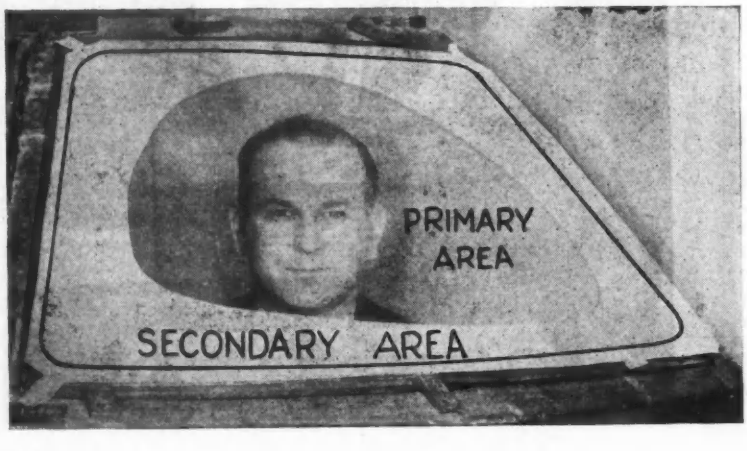
PROBABLY no material is more familiar to all of us than glass. Although we are generally conscious of its presence, seldom do we take notice of glass unless it is broken or for some reason we cannot see through it. The pilot of an airplane rarely actually sees the windshield. He is interested only in looking through it and at all times with normal vision. Therefore, when flat laminated polished plate glass of three-inch and greater thicknesses was made that transmitted images clearly and without distortion, it was considered a great achievement and rightly so. But when curved laminations were developed having almost the same accuracy, that was a real accomplishment.

Many of our country's leading aircraft designs have now incorporated the curved laminated windshield. Its use is highly desirable from the standpoint of safety, aerodynamics and appearance. It affords the maximum vision for the pilot. No reports are on file of collision with birds in flight causing serious damage to a curved windshield. The accompanying photograph shows a modern transport with curved windshield, illustrating some of the points mentioned. With the added stability of curved contours, annealed glass which upon breaking does not entirely obscure vision can be used in curved windshields. Impacts which crack the glass do not seriously impair vision even bullet marks on a windshield have small effect on visibility.

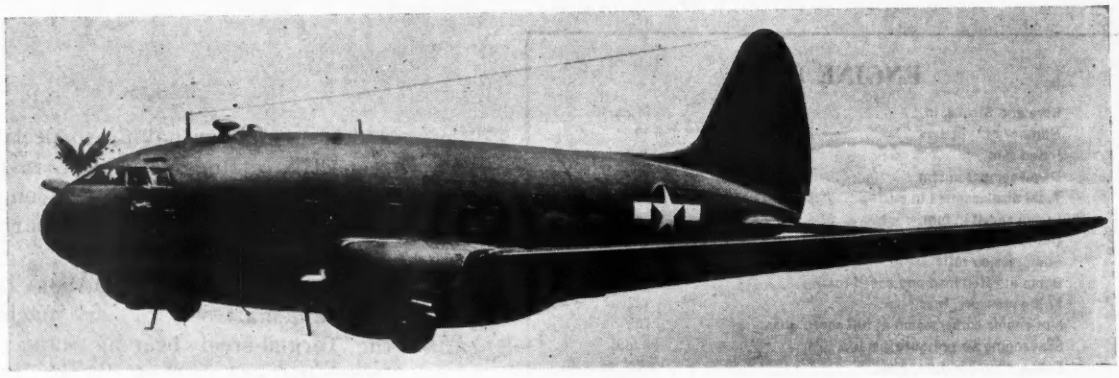


Effects of bullets on a curved windshield (annealed glass). 38 cal. and 50 cal. at 90 deg. penetrated the windshield, but 38 cal. at 45 deg. and 22 cal. did not penetrate it.

The curved windshields add several air-miles to the speed of the transport so equipped. Numerous experiments were tried in designing the Constellation (Ref. A) and the findings indicate clearly that the curved windshield increases the speed and range of heavy transports. Using the Commando as a specific example, computations (Ref. B) based on an air speed of 240 mph at sea level brings out the fact that the use of the curved windshield in the fully faired nose has an advantage of 5.5 mph over the original transport-type flat windshield. Calculations for the increased drag brought about by the use of the flat type windshield indicate that the loss in speed is 5.5 mph, but in addition to this, it was found that for full operation at 240 mph an additional 204 bhp is required. This fact reduces the range of the aircraft in that to supply this extra horsepower about 80 lb additional fuel per hour of flight will be required. The windshield referred to has a total area of approximately 7.5 sq ft and a total weight of 35 lb or about 4.7 psf of



Vision areas of a windshield.



Modern faired nose of transport in flight shunting a duck from its curved windshield

Glass Windshields

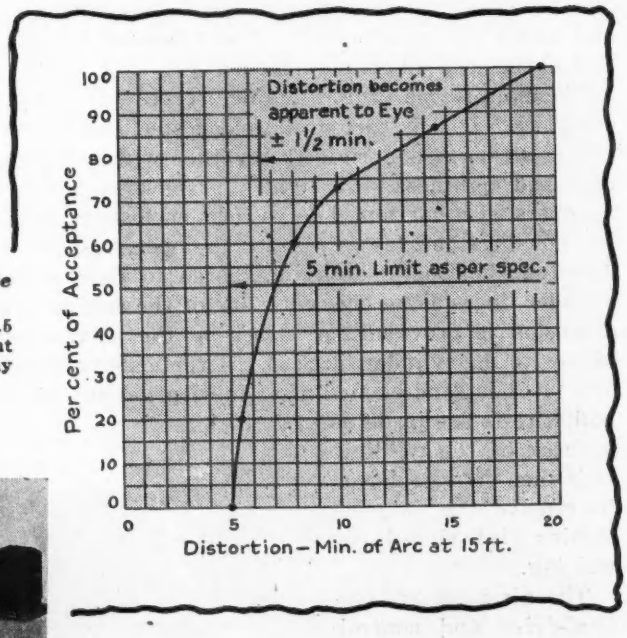
windshield. In addition to the above statistics, it is also readily acknowledged that the outward streamlined appearance of the curved windshield has a distinct advantage.

Curved Windshields Are Expensive

Curved windshields are expensive. The outstanding objections to the use of curved windshields have been the breakage due to difficulty of installation and the loss due to the inaccurate and impractical methods of determining the amount of optical distortion present in each pane of glass manufactured. Factors that increase curved windshield costs are that difficult contours must match with a very close tolerance; any pressure used to fit such a windshield later will cause breakage or optical distortion; generally mounted without individual frames, the removal of damaged windshields is extremly difficult; and approximately 15 per cent of all curved windshields produced are rejected because of defective optical properties.

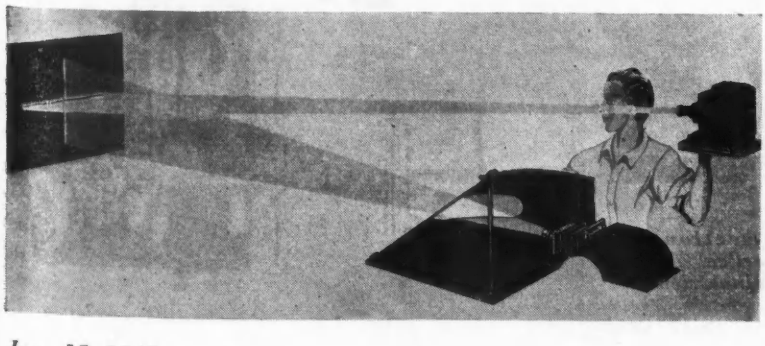
Up to the present time, the only method of inspecting a windshield has been to hold the glass up before the eyes and look through it toward some line, light or object trying to locate an unseen something—namely, distortion. To the pilot, making his split second decisions, distortion may mean everything. This problem of accurately locating any distortion present and measuring the amount that exists in the glass has received considerable attention and as a result of these studies a practical mechanical means of inspecting windshield glass for optical properties has been developed that reduces fabrication costs and helps to increase aerial safety.

(*Turn to page* 114, *please*)



(Right)—Optical distortion windshield acceptance chart.

Example: Acceptance of glass with no more than 5.5 min-arc of distortion will permit the use of only 20 per cent of curved laminated windshields of a certain contour—any mfr. Chart changes for each shape.



(Left)—Adjustable target windshield inspection equipment for use on any type of windshield, on a production basis.

ENGINE DATA

Bore and Stroke, in.	8⅛ x 10
Number of cylinders	10
Rated rpm	720
Displacement in cfm	4321
Total displacement in cu. in.	10,370
Piston speed in fpm	1200
Output at rated rpm (bhp)	1600
Compression ratio	18.5 to 1
Bmep at rated load and speed (psi)	84.9
Firing pressure, max., psi	1220
Hot engine compression at full speed, max., psi	750
Scavenging air pressure, psi	3 to 6
Exhaust temperature, max., F.	770
Cylinder relief pressure, psi	2200
Fuel to injection pump, psi	5 to 20
Nozzle opening pressure, psi	3000
Weight of engine (dry), lbs.	33,182
Weight of engine (wet), lbs.	33,632
Lubricating oil for fill, gal.	20
Water for fill, gal.	41

Average fuel consumption:

Bhp	Rpm	Lb. per Bhp-hr. (10-cyl.)
1600	720	0.375
1200	720	0.390
800	720	0.450
400	720	0.590

a sheet-metal top having inspection covers over the respective cylinders. These inspection covers are spring-loaded so that in an emergency of undue pressure in the crankcase compartment the excessive pressure will be relieved.

The main (plain and thrust) bearing saddles for the crankshaft bearings are machined together with the forged-steel bearing caps. These are then match-marked to show proper location.

To this basic frame, or cylinder block, individual cylinder units (Figs. 2 and 3) are added by bolting the liner portion of these units to the top deck of the frame. Each unit is comprised of a liner, a shrunk-fit jacket, rubber seal rings and a lock ring. The liner and jacket form a water space for cooling the combustion chamber. Vertical ribs on the liner direct the water circulation upward for uniform

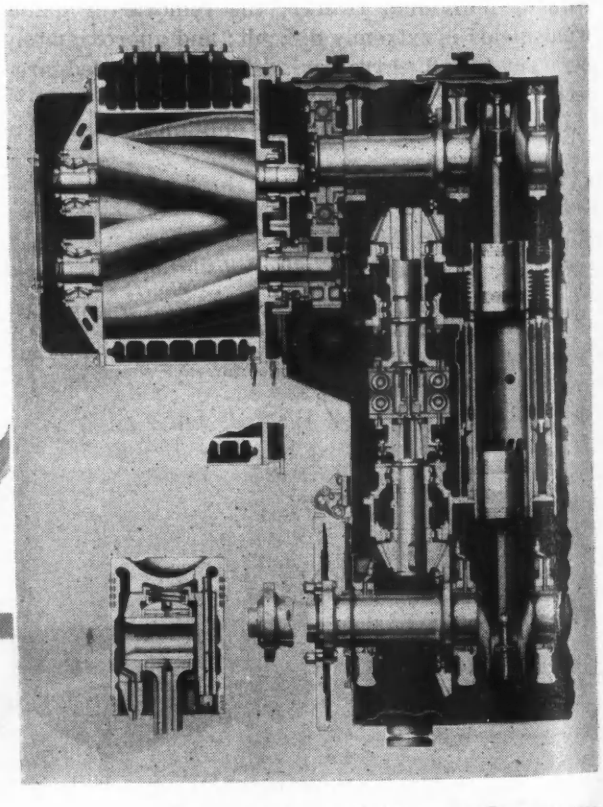
Novel Design Feature

By Philip Ruskin

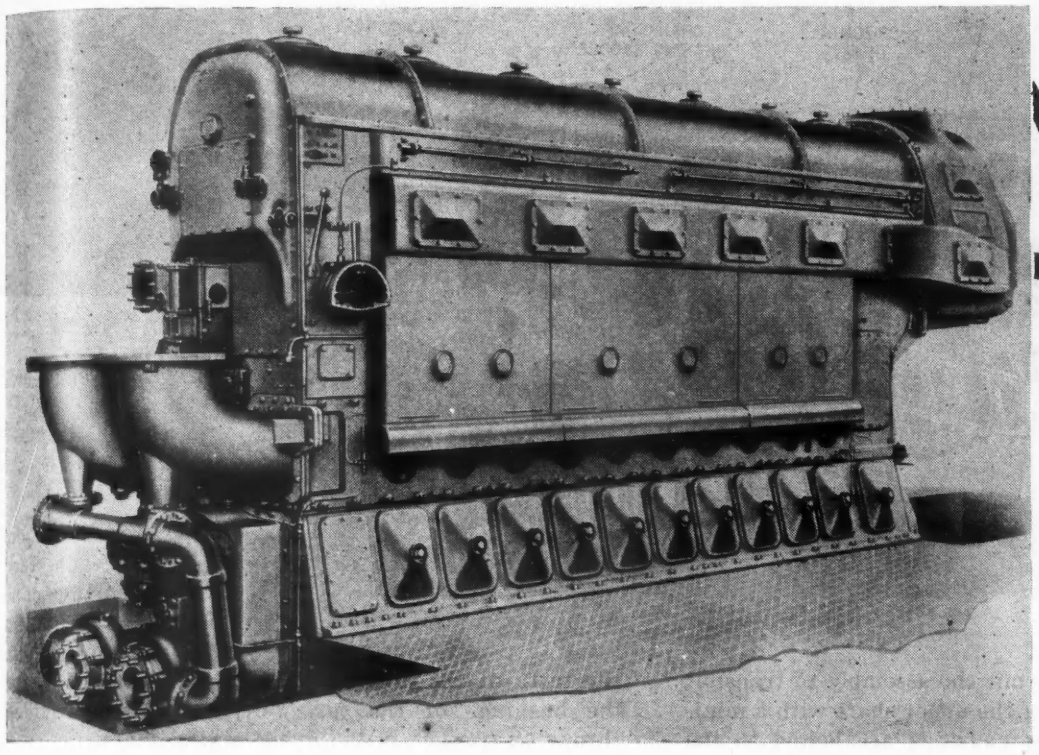
THE latest series of Fairbanks-Morse Diesel engines, Model 38D8-⅛, feature two-stroke cycle operation of opposed-piston cylinder arrangement in sizes ranging from three to ten cylinders with a net output of from 150 to 2000 hp, respectively, at 800 rpm. Each engine is a self-contained unit complete with scavenging blower, fuel, lubricating-oil and water pumps attached. The following description covers the 10-cylinder model.

The main frame (Fig. 1), which serves as a "cylinder block," is constructed of welded steel plates providing strength and rigidity together with compactness and lightness in weight. Transverse vertical members with horizontal decks form enclosures, bearing housings and fastenings for the operating parts. The four horizontal decks are bored to receive the cylinder liners along the centerline of the engine. An extension is provided for attaching the scavenging blower to the cylinder block at the vertical-drive end. The block is sand-blasted after lubrication and Magnaflux tests are made as a check of the welding. It is then stress-relieved to remove the internal strains introduced by welding.

The air receiver, vertical-drive and control-end compartments in the cylinder block are provided with covers. The upper-crankcase compartment is closed with



Engine cross-section at blower and vertical drive end, longitudinal view.



Control end and control side of 10-cyl Model 38D8-1/8 engine

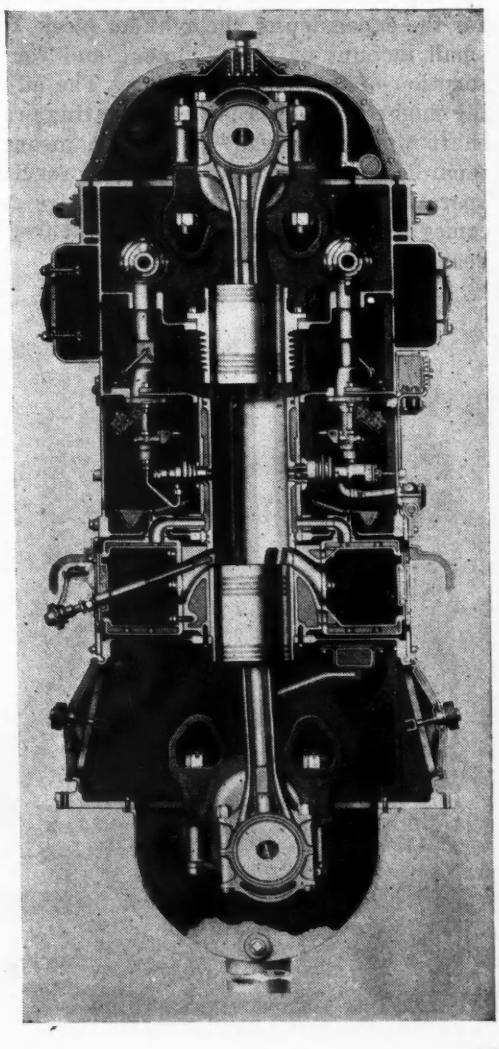
of Fairbanks-Morse Opposed-Piston Engines

cooling. Circular ribs near the top of the liner fall within the intake-air stream and help to carry off some of the heat of combustion. The rubber rings serve as a water seal between the liner and the jacket; the lock ring prevents movement of the liner due to expansion under heat. Tangentially-directed inlet ports give a whirling motion to the scavenging air, causing extra turbulence.

There are two 8⅛ in. diam pistons in each cylinder, one acting upward and the other downward, each on a 10-in. stroke. Positive oil-cooling of the pistons is provided in addition to the conventional lubrication of the piston-pin bearing surface via drilled passages in the connecting rod. Upper and lower connecting rods and pistons are similar but are not interchangeable. Match marks are provided to show the proper location of each part.

Special cast chrome-nickel-molybdenum crankshafts, upper and lower, transmit power from the individual cylinders to a common drive, the upper shaft delivering its power to the lower shaft through a bevel-gear arrangement. Thrust bearings are provided at the ends of the shafts next to these gears to offset lateral forces. The upper crankshaft supplies the sprocket for timing-chain drive, the camshaft for air-start drive and the scavenging-blower drive gear. The lower shaft includes a torsional damper, pump-drive gears and a coupling for final delivery of the combined power of the two crankshafts to the end-use.

The vertical drive path of power (Fig. 4), from the upper shaft to the common drive on the lower shaft, represents a thoroughly-engineered mechanism designed to perform a difficult job satisfactorily. Combination thrust and roller bear-



Engine cross-section, transverse view.

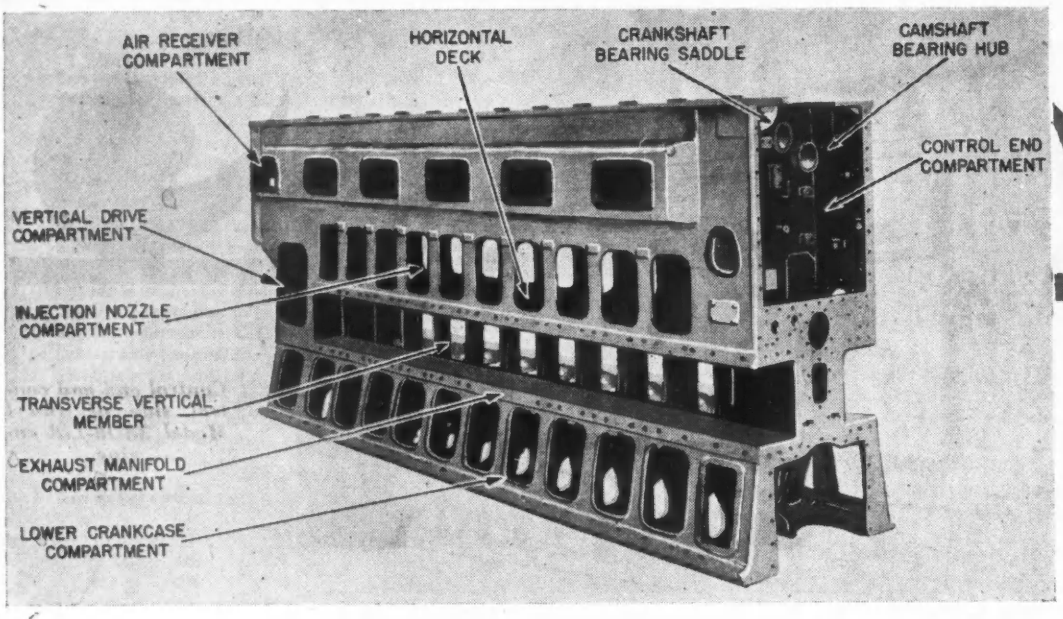


Fig. 1—Cylinder block.

ings, top and bottom, permit the assembly to transmit the net available power of the upper shaft with a minimum loss. The bearing housings are bolted to the horizontal decks of the cylinder block. A flexible coil spring coupling unit, an adjusting flange and a flexible coupling hub form a central assembly which serves to connect the upper and lower halves of the vertical drive. Such an arrangement allows for the expansion of the cylinder block, for a small amount of misalignment and for absorption of torsional vibration. The adjusting flange provides a means of setting crankshaft timing, or lead, and also a means of separating the vertical drive for servicing operations. Lubrication for the entire drive comes from the main upper and lower oil headers.

Branches from these leads feed the bearings, and nozzles direct a stream of oil onto the teeth of the pinions and gears. Lubrication for the bushings of the spring-drive unit is provided through a passage in the upper pinion shaft.

The fuel injection system for each cylinder (Fig. 5) consists of two injection pumps, two nozzles and the necessary tubes. These units are enclosed in the

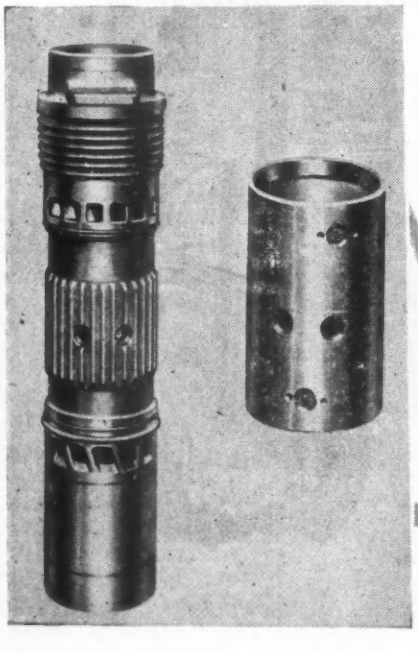


Fig. 2—Cylinder liner and jacket.

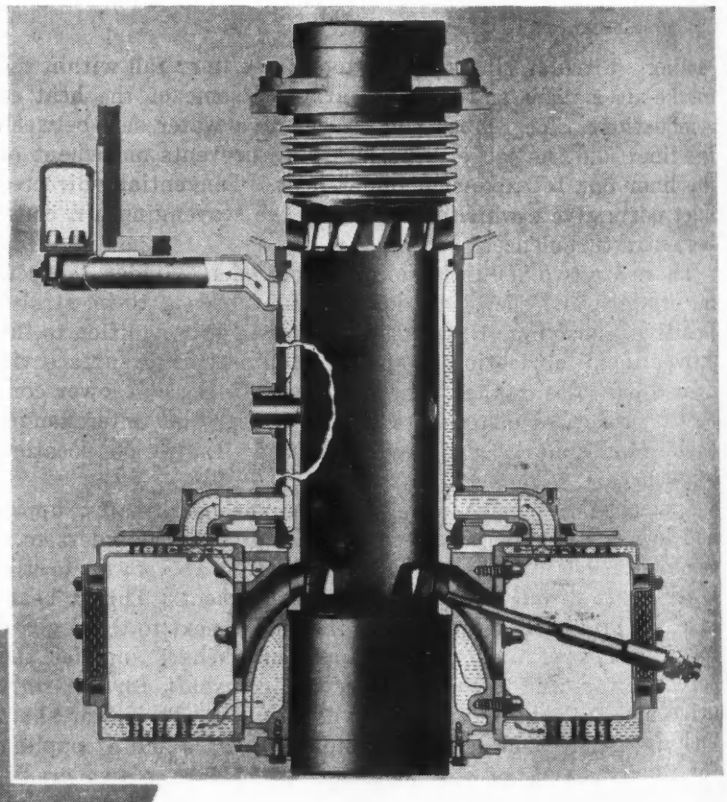
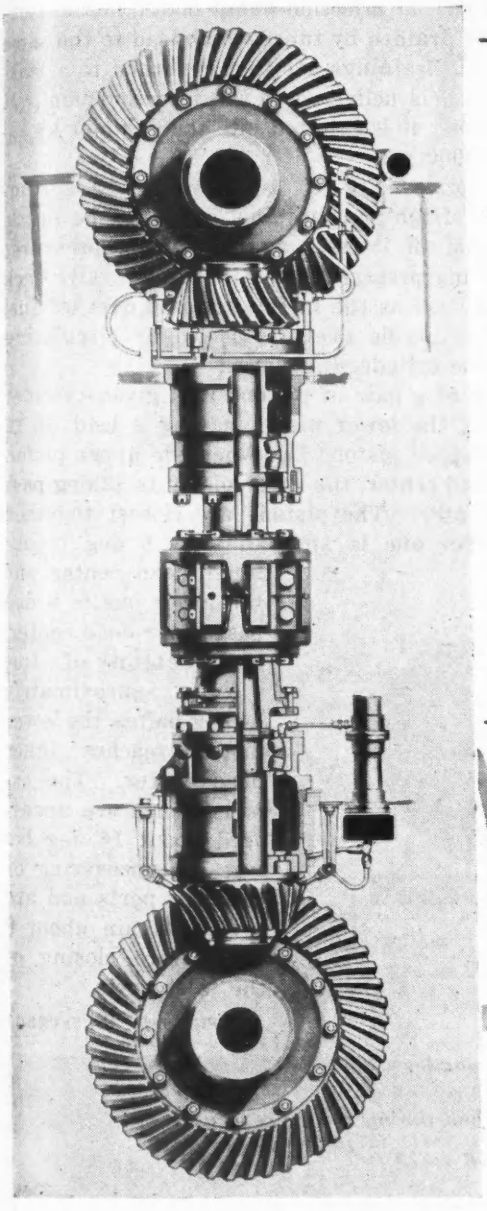


Fig. 3 — Cylinder liner and associated parts.



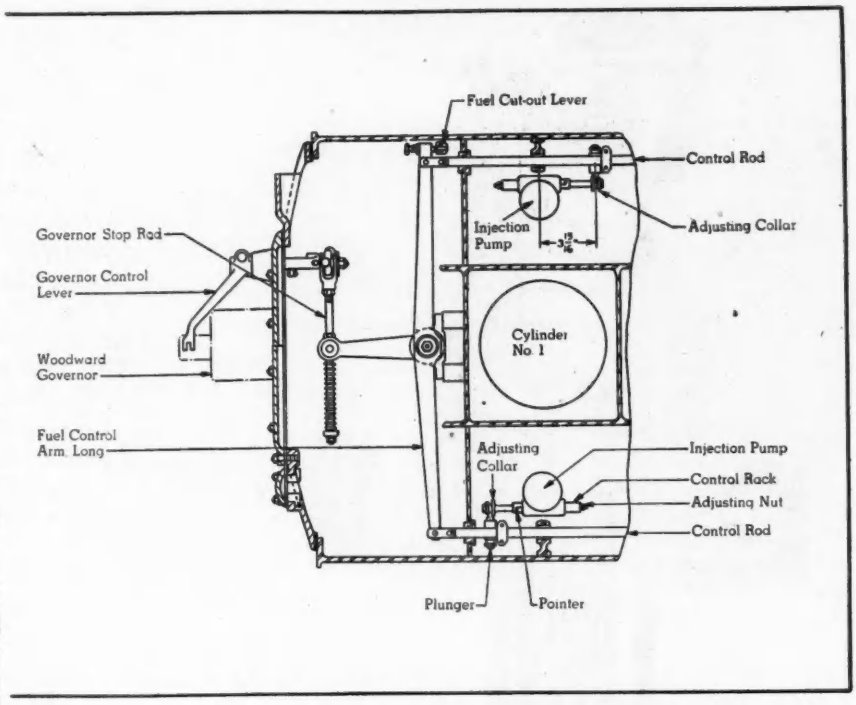
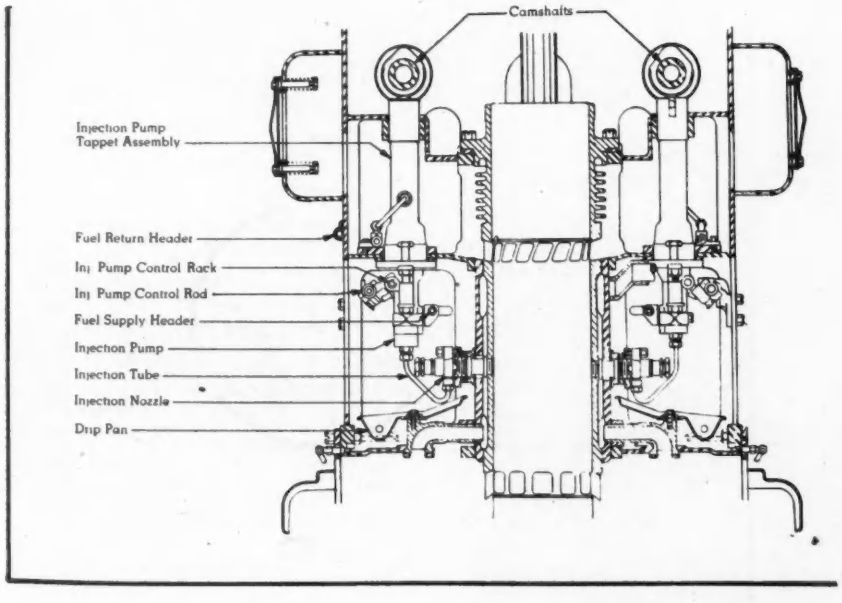


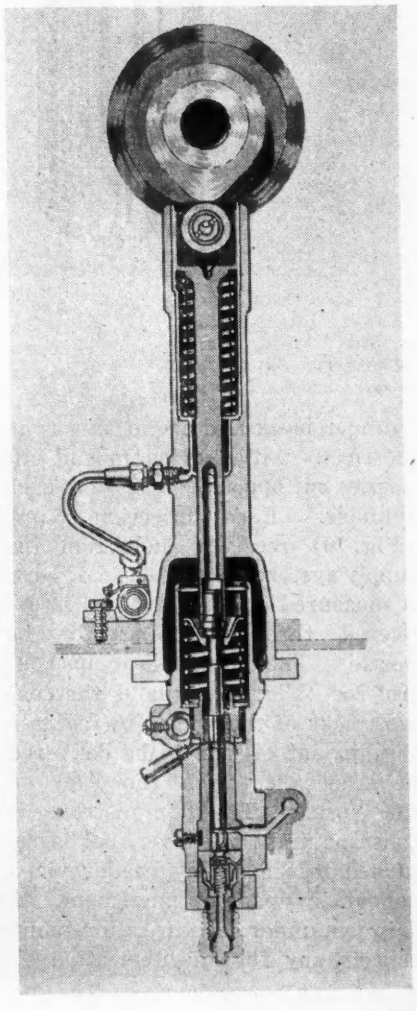
Fig. 7—Fuel control linkage and injection pump adjustments.

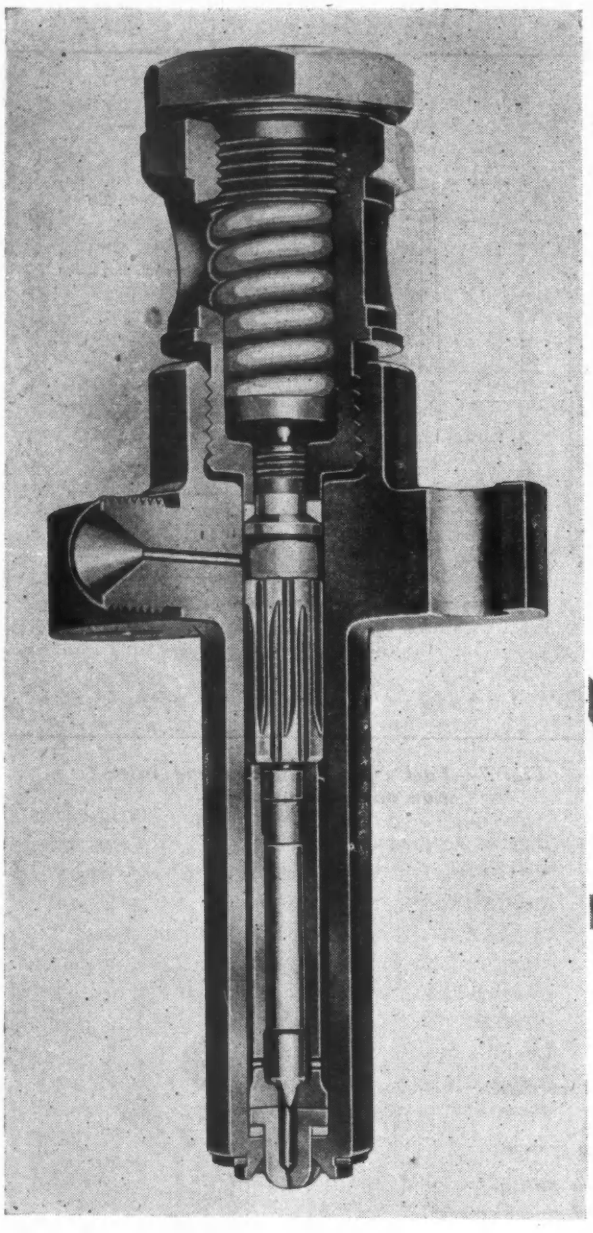
Fig. 4 — Crankshaft vertical drive.

Fig. 5—Fuel injection system.

Fig. 6—Fuel injection pump.







drainings from the injection-pump body; nozzle compartments are drained by tubes which lead to the same drip pans. All drainings are then returned to a leakage tank. Fuel is delivered to the injection pump at from 5 to 20 psi; it is injected into the cylinder at approximately 3000 psi.

The fuel nozzle (Fig. 8) is, in reality, a spring-loaded valve. High-pressure fuel entering the nozzle lifts the needle off its seat against spring pressure; similarly, spring pressure snaps the needle valve back to its seat as soon as the injection pump cuts off fuel pressure. The needle sleeve is cooled by circulating water from the cylinder-liner area.

The timing of a pair of pistons in a given cylinder (Fig. 9) finds the lower piston having a lead of 12 deg over the upper piston; *i.e.*, when the upper piston is on outer dead center, the lower piston is 12 deg past outer dead center. The pistons are closest together when the upper one is approximately 6 deg before inner dead center and the lower one is 6 deg past inner dead center.

Injection of fuel starts approximately 14 deg before the lower piston reaches inner dead center. The exhaust ports are uncovered about 16 deg before the uncovering of the inlet ports and are covered again about 8 deg before closing of the inlet ports.

(*Turn to p. 98, please*)

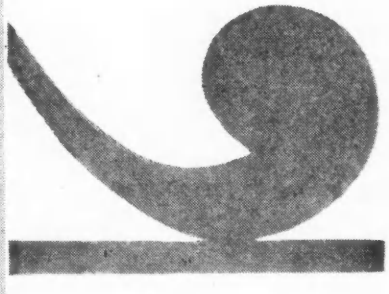
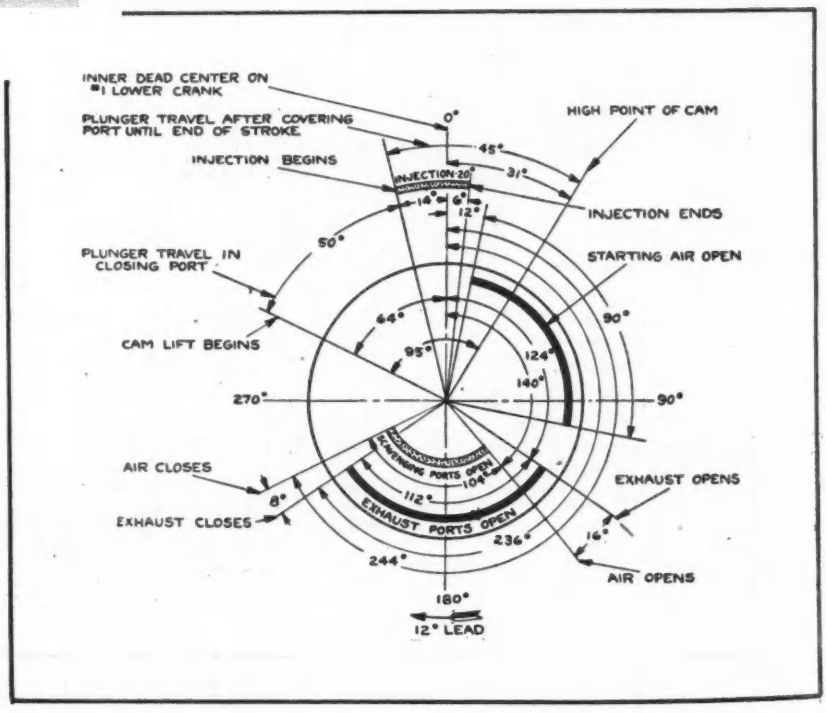


Fig. 8—Injection nozzle.

Fig. 9—Sequence and timing of events in a complete two-stroke cycle at full load and full speed.



cylinder block and are located symmetrically with one pump and one nozzle on opposite sides of each cylinder. Each injection pump (Fig. 6) receives fuel from the supply system at the fuel-inlet port. A measured quantity of fuel is delivered through tubing to the nozzle. The injection-pump control rod (Fig. 7) actuates the control racks of the pumps to regulate the amount of fuel to be delivered in accordance with the load on the engine. The pump stroke is constant and the excess fuel is returned to the supply header via a helical by-pass arrangement. A drip pan under each injection pump collects any fuel or lubrication oil

Ford '46

Super Deluxe and Truck Features

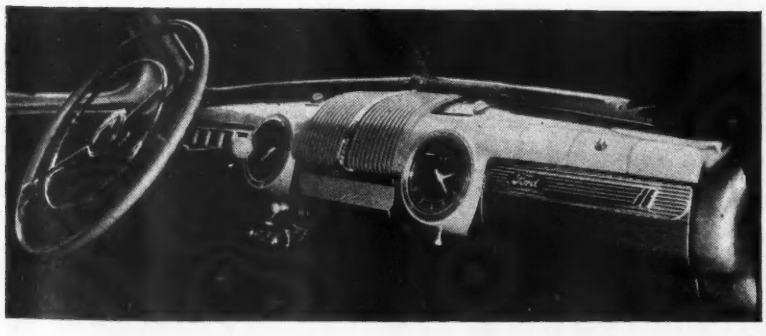
Super Leluxe front end. The grille is a major styling change.

FIRST passenger car announcement for the postwar market has been made by the Ford Motor Co. in releasing details of its 1946 Ford Super Deluxe model, which will be powered by the 100 hp V-8 engine of 239.4 cu in. displacement and 6.4 to 1 compression ratio. The 1942 engine was rated at 90 hp with a displacement of 221 cu in.

New features in the 1946 engine include tri-alloy connecting rod bearings (see AUTOMOTIVE *and* AVIATION INDUSTRIES—Jan. 15, 1945), aluminum alloy pistons fitted with four rings to replace the three-ring cast steel pistons formerly used, and an improved type rear main bearing seal. The wiring harness has a synthetic covering of high dielectric properties and in addition the ignition system is coated with a special lacquer developed during the war for protection against moisture and tropical fungus growth. Ford also is introducing a new type distributor designed to prevent condensation and sealed against outside moisture. Oil bath air cleaner and oil filter are standard equipment.

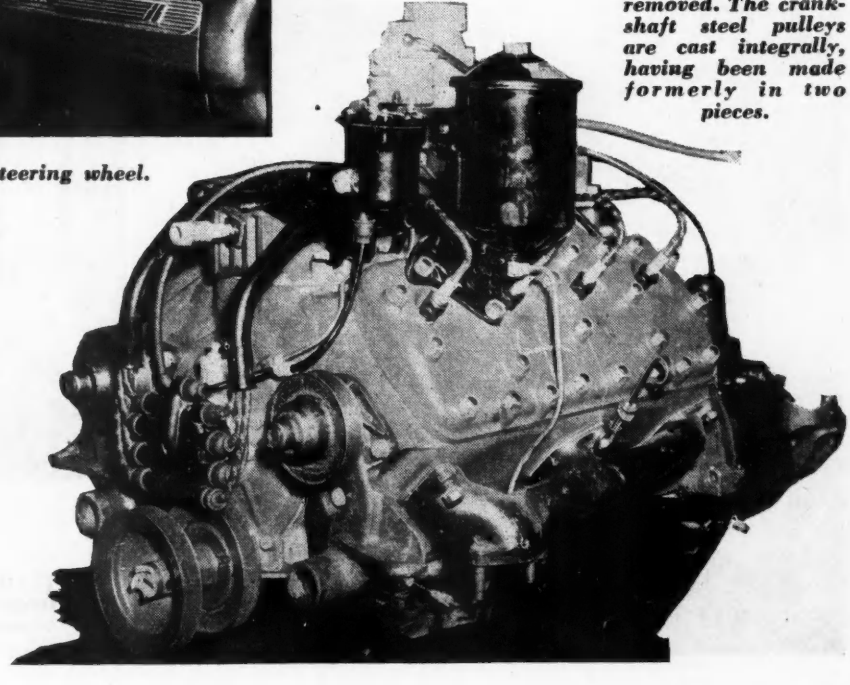
Among the changes on the chassis are a lower rate rear spring and a stabilizer

(*Turn to page* 98, *please*)

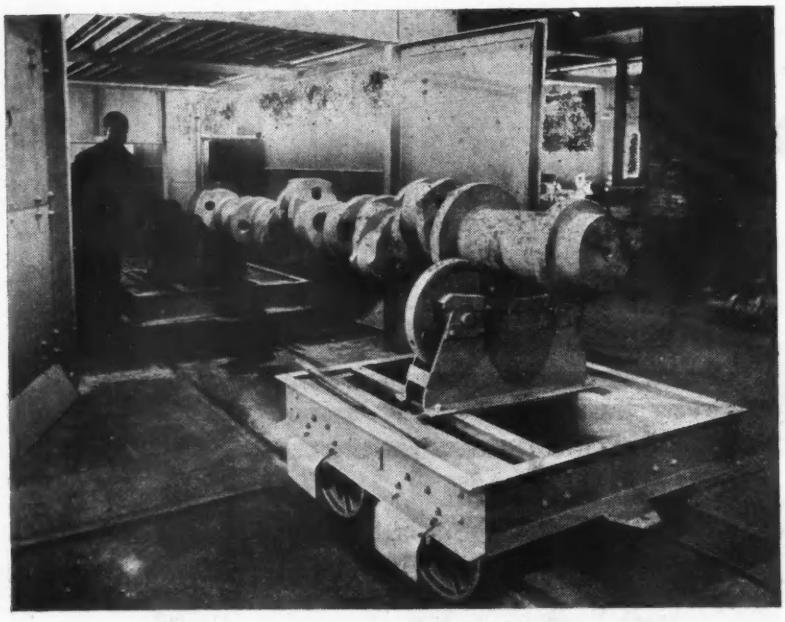


The new instrument panel and steering wheel.

Hub cap styling.



Front end of Ford truck engine with generator and fan removed. The crankshaft steel pulleys are cast integrally, having been made formerly in two pieces.



One of two large booths used for shot-blasting crankshafts prior to shipment. This operation produces a fine over-all finish, facilitating surface inspection as well.

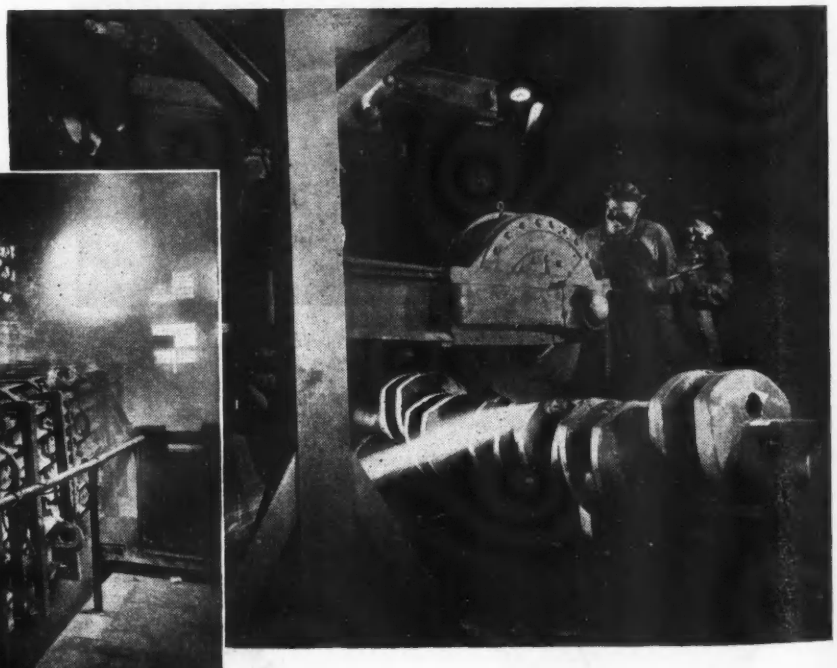
Cast

By Joseph Geschelin

DURING the war an exceptionally high tonnage of large cast crankshafts for Diesel engines has been delivered by the C. W. C. Crankshaft Corp, a subsidiary of Campbell-Wyant-Cannon Foundry Co. of Muskegon. This foundry activity, representing the first instance of quantity production of cast crankshafts, is distinguished by great versatility of range in size of work—from small shafts about 50 pounds in weight to enormous ones weighing upwards of 10,000 pounds and about 21 ft in length. This performance marks the culmination of many years of intensive research and development, stemming from the initial introduction of the Proferal electric furnace ferrous alloy in cast camshafts first adopted by Hudson and later extended to practically every passenger car engine produced in this country.

It is doubtless true that the exigencies of the war—the need for high production of large Diesel engines and the shortage of heavy forging facilities — provided the impetus for large scale use of cast crankshafts. Certainly these factors hastened the widespread use of Proferal shafts and introduced them into engines produced by commercial engine builders.

(Right) In the cleaning room—one of the big swing grinders at work grinding large shafts.



(Left) First stage of pouring operation on large crankshafts. The mold is held horizontally, as shown, while the metal is poured extreme rear.

Following initial preparation and baking, the mold is assembled with its complement of baked cores at this station. The assembly returns to the baking ovens for final bake.

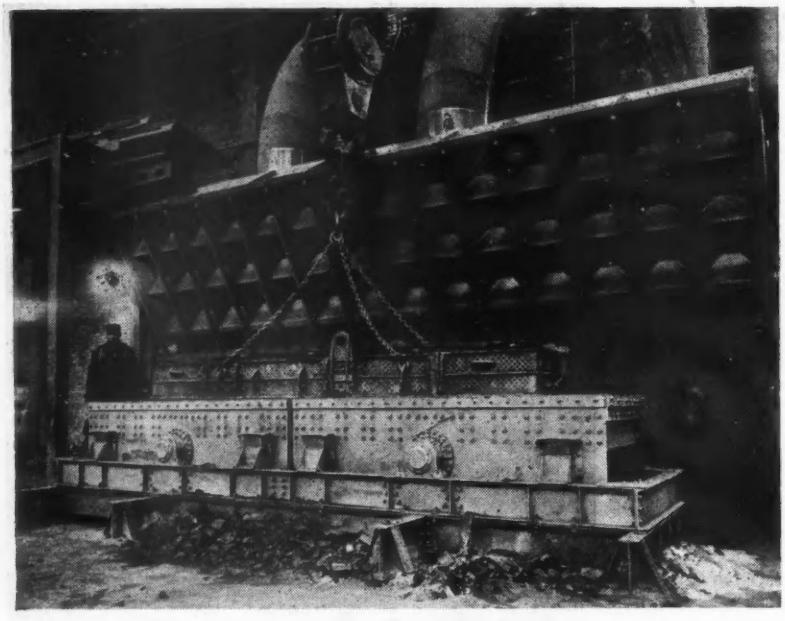
From the standpoint of the user, the cast crankshaft is said to have a number of important advantages both in design and manufacturing economy. Among these may be noted the following:

1. It offers a relatively low-cost method of producing large crankshafts in small lots.
2. Foundry practice implies a flexibility of design pattern and permits of engineering changes, owing to the relatively lower cost of pattern equipment.
3. C-W-C procedure is said to produce a high order of accuracy in the dimensions and positioning of cheeks, webs, and counterweights, thus eliminating all machining of these elements.
4. Similarly, close control permits the casting, of pins, journals, and flanges close to finished size, thereby reducing finish-machining.
5. Foundry practice permits the coring of heavy sections such as journals, permitting a major reduction in overall weight without machining.
6. Proferal parts do not require heat treatment to develop

Crankshafts

Their Quantity Production through Special Techniques and Rigid Control at C-W-C Foundry

Second stage of pouring operation. The mold is tilted into the pit and held in a vertical position for a timed interval to permit the metal to flow properly into the cavity. This view shows the variety of sizes of molds and pits found in the foundry.



Latest acquisition in the foundry is this enormous Simplicity shake-out unit capable of handling the largest molds produced in Plant 4.

The development of a specific design requires cooperative action on the part of the engine designers and foundry technicians so as to effect the proper distribution of metal in conformity with good casting practice. The term Proferal is applied to a family of alloys produced in electric furnaces. Actually the composition of the alloy for each type of crankshaft is varied in accordance with the physical size and weight of the work. Acordingly, each design is treated as an individual research problem, approached first on the basis of known fundamentals and later modified from X-ray studies of castings. Although the mechanics of the foundry process appear relatively simple to an outside observer, closer examination reveals that every step relies upon painstaking attention to detail developed by fundamental research.

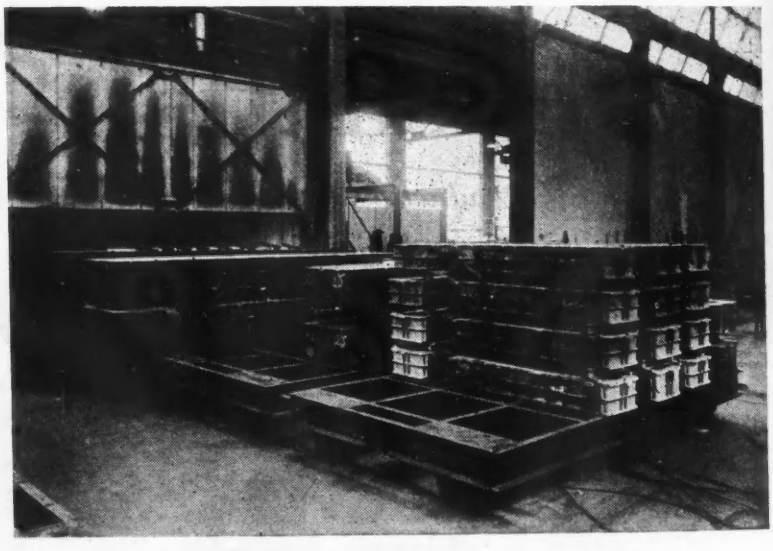
Secret of foundry technique is found in the development of special procedures in

(*Turn to page* 110, *please*)

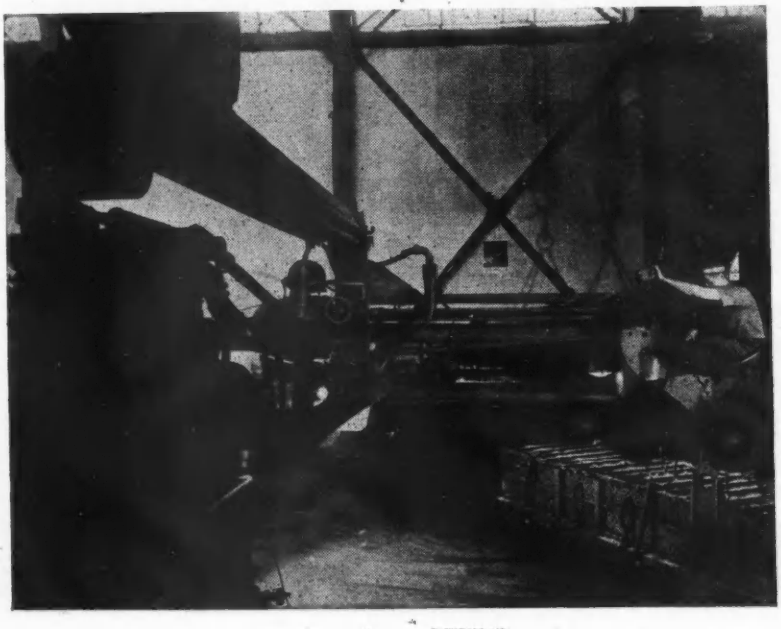
maximum physical properties or hardness as these are obtained by controlled cooling while in the mold. Average hardness value runs around 285 Brinell.

7. Finally it is claimed that the cast shaft will tolerate any type of commercially known bearing alloy.

Although the modulus of Proferal is lower than that of forged steel shafts, correct design practice permits the use of cast crankshafts without weight penalty. One important property, said to have been verified by actual tests, is unusual resistance to fatigue in flexure (due to misalignment in large engines), about five times that of forged steel shafts. Another advantage, more difficult to demonstrate practically, is that of the inherent damping characteristics of a cast ferrous alloy.



One of the large ovens in which cores and molds are baked in successive stages as discussed in the text.



The large crankshaft molds are prepared with the use of this enormous sand slinger —a rapid mechanical operation.

Skin rolls, shot blasted in 17 grades of roughness, produce Inland Sheets that are easy to draw. The roll shown above has been ground, then shot blasted on one end to show contrast between ground and shot blasted surfaces.

AN INLAND ACHIEVEMENT

that revolutionized deep drawing

Several years before the start of World War II Inland engineers and metallurgists developed a new type of cold rolled sheet that solved a baffling deep drawing problem. The part was a deep drawn front fender on which breakage had been running from 30 to 50%. The special sheet produced by Inland resulted in thousands of these difficult fenders formed with only 3% average breakage.

This Inland development was a special method of preparing rolls for the temper mills. Instead of the usual smooth and bright surface, the Inland sheets were given a new type of surface that permitted radical improvements in steel processing. It also enabled fabricators to improve die performance. This "new surface for severe draw jobs" held the die compound, permitted better control of slippage, required less hold-down pressure, and provided freedom from scoring, resulting in more uniform draw distribution so necessary and desirable in meeting the intricate drawing requirements of modern designers and fabricators.

This is only one of the many product improvements pioneered by Inland—improvements that are making better equipment for war and that will help produce finer peacetime products.

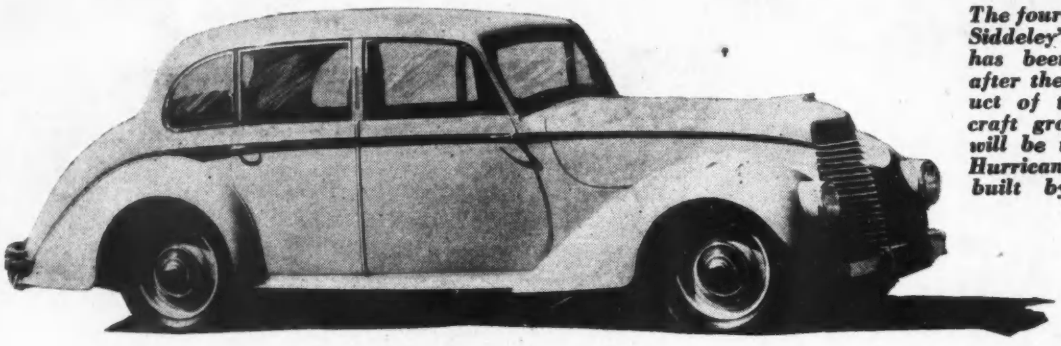
An Inland specialist awaits your call to tell you about these developments and their many applications.

Bars • Floor Plate • Piling • Plates • Rails • Reinforcing Bars • Sheets • Strip • Structurals • Tin Plate • Track Accessories

INLAND STEEL COMPANY

38 South Dearborn Street, Chicago 3, Illinois

Sales Offices: **Cincinnati • Detroit • Indianapolis • Kansas City • Milwaukee • New York • St. Louis • St. Paul**



The four-door sedan of Armstrong-Siddeley's new 16 hp model. It has been named the Lancaster after the British bomber, a product of the Hawker-Siddeley aircraft group. Another body type will be the cabriolet, named the Hurricane after the British fighter built by the Hawker-Siddeley group.

Four British Companies

BRITISH automobile manufacturers are ready for the relaxation of Government restrictions so they can equip their plants and procure materials for the production of their postwar passenger cars. So far plans have been announced by four companies in England. Armstrong-Siddeley Motors, of Coventry, and the Austin Motor Co., of Birmingham, will add a new model to their lines, while Rolls-Royce, of London, intends to resume production of its models basically similar to those current at the outbreak of the war in 1939. This means the Phantom III 40-50 hp V-12 (448 cu in.) and the Wraith 25-30 hp Six (260 cu in.) of the Rolls Royce range and the sports type known as the 4¼ liter Bentley. The Rolls-Royce announcement states that "at this stage the company has decided not to enter the lower horsepower range." Prices were not quoted, nor has any information been given to date as to when postwar deliveries will commence.

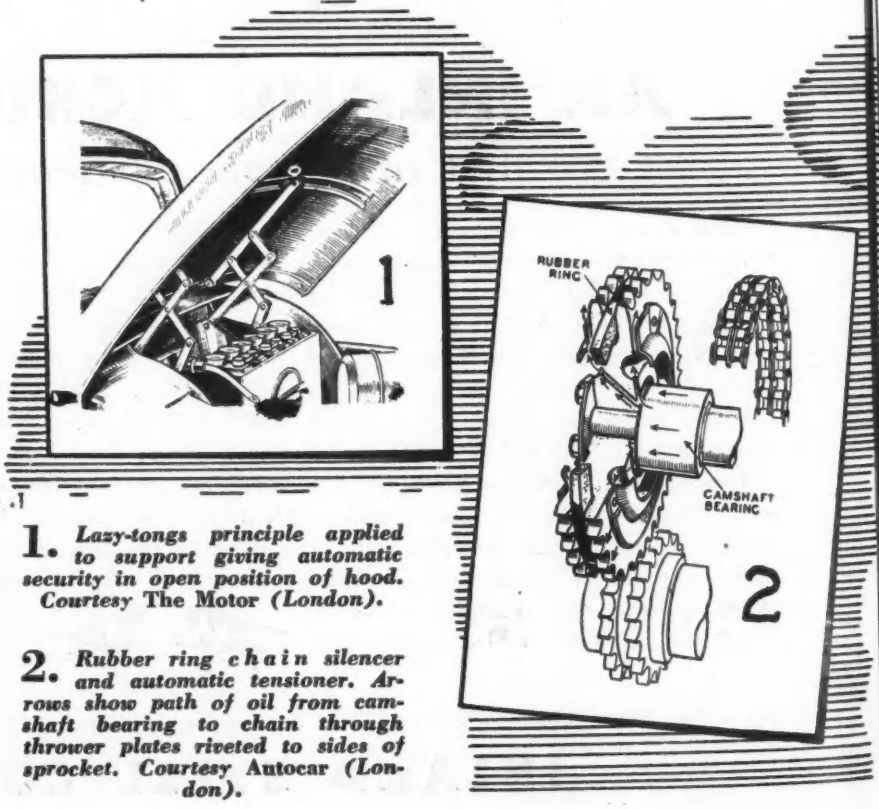
Standard Motor Co., of Coventry, will build two models only during the immediate postwar period. They are an Eight (8 hp) and a Twelve (12 hp), the latter to be offered with a 14 hp engine as a buyer's option. This postwar line compares with a range of six models in 1939, the largest having a 20 hp six-cylinder engine. Deliveries are expected to commence about 14 weeks after existing Government regulations are modified to make available material supplies and labor for the production of cars for civilian use.

Armstrong-Siddeley Models

The prototype of the new Armstrong-Siddeley model has been designed and tested in readiness for production. It has a two-liter (122 cu in.) six-cylinder overhead valve engine, rated at 16 hp, and will be offered in two body styles, a four-door six-light sedan and a two-door cabriolet with folding top. Prices have not yet been announced. Deliveries are expected to begin about six months after Government restrictions are relaxed.

Only brief particulars of the chassis design have been released, though it is stated that it includes independent front suspension, which Armstrong-Siddeley had adopted for some models before the war, and, at purchaser's option, either a synchromesh transmission or one of the Wilson pre-selective type—the latter a

New features of the British Austin cars for postwar production



1. *Lazy-tongs principle applied to support giving automatic security in open position of hood. Courtesy* The Motor *(London).*

2. *Rubber ring chain silencer and automatic tensioner. Arrows show path of oil from camshaft bearing to chain through thrower plates riveted to sides of sprocket. Courtesy* Autocar *(London).*

form of transmission pioneered by this firm many years before the war. Another option will be wire-spoked and steel disk wheels. An in-built mechanical jacking system will be included. This new model does not have running boards.

The one-piece hood extends forward over the radiator to the grille, with its locking catch concealed in the grille. The latter, though differing from the prewar design, is in the traditional Armstrong-Siddeley style—a rearwardly inclined Vee. Aluminum is to be extensively used in the bodywork; e. g., for the hood, door and side panels and trunk door. In other directions, too, effort has been made to obtain a good power-to-weight ratio.

What other Armstrong-Siddeley models will be offered later on is not stated. In 1939 there were five distinct types, all overhead valve Sixes, ranging from 14 hp (104 cu in.) to 25 hp (226 cu in.). One of the prewar cars was a 16 hp model with a piston displacement identical with that of the postwar car referred to above.

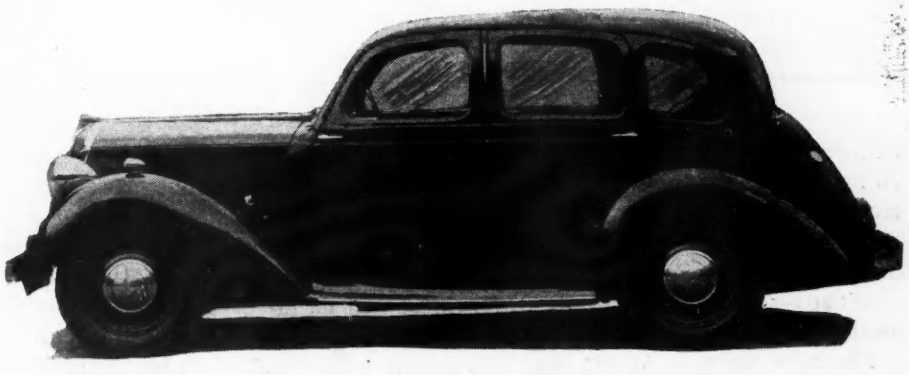
Austin Postwar Cars

The Austin company, which recently held a display of its postwar models at the showroom of its Longbridge Works, will offer four models, all with four-cylinder engines. There will be no counterpart, therefore, of the three six-cylinder models—14 hp, 18 hp

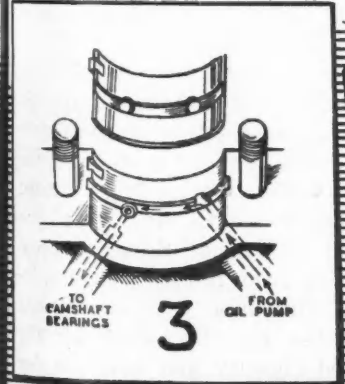
Announce Postwar Models

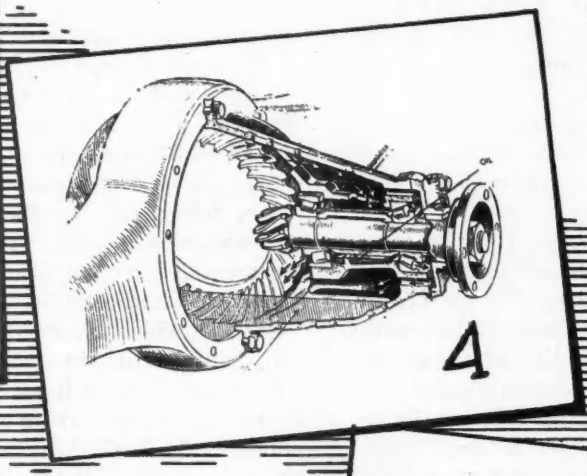
By M. W. Bourdon

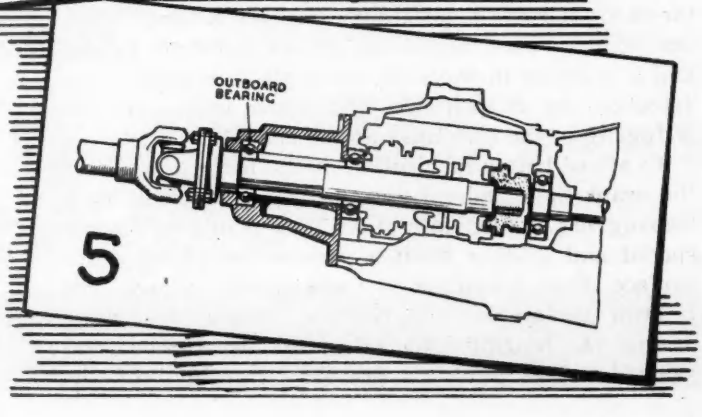
Special Correspondent of AUTOMOTIVE *and* AVIATION INDUSTRIES in Great Britain



Standard's postwar Twelve sedan, a four-door, five-passenger car. It has a 100-in. wheelbase and weighs (empty) 2500 lb. The Eight sedan will be a two-door, four-passenger car on an 83-in. wheelbase.







3. ***Oil feed to camshaft bearings from crankshaft journal bearing liners through metering orifice. Courtesy*** **Autocar** ***(London).***

4. ***Extended bevel pinion shaft with bearing lubrication increased by provision of galleries and an oil trough around the shaft. Courtesy*** **The Motor** ***(London).***

5. ***Diagram showing new outboard bearing for driven shaft of four-speed transmission. Distance piece between bearings forms an oil trough for outboard bearing lubrication. Courtesy*** **Autocar** ***(London).***

Design Data of Postwar Austin Cars

	Eight	Ten	Twelve	Sixteen
Number of cylinders	4	4	4	4
Bore, in.	2.24	2.50	2.73	3.12
Stroke, in.	3.50	3.50	4.00	4.37
Displacement, cu. in.	55	67	91	134
Valves	L-head	L-head	L-head	Overhead pushrod
Compression ratio	6.8:1	6.2:1	6.2:1	6.8:1
Maximum power	27 bhp at 4400 rpm	32 bhp at 4000 rpm	42 bhp at 4000 rpm	58 bhp at 3700 rpm
Maximum torque	36 lb-ft at 2000 rpm	45 lb-ft at 2000 rpm	70 lb-ft at 2200 rpm	108 lb-ft at 1900 rpm
Total gear ratio: First	21.66	21.66	18.48	15.5
Second	12.92	12.92	12.04	10.1
Third	8.25	8.25	7.63	6.4
Fourth	5.375	5.375	4.89	4.1
Reverse	27.8	27.8	22.9	19.2
Wheelbase, in.	88½	93¾	104½	104½
Tread in.: Front	44	47	53½	53½
Rear	45	48	56	56
Overall length, in.	149	158	171	171
width, in.	56	58½	68	68
height, in.	63	64½	64½	64½
Ground clearance, in.	6	6	6¾	6¾
Turning circle, ft.	37	38	40	40
Weight, dry, lb.	1700	1900	2460	2900
Tire size	4.50-17	5.00-16	5.50-16	5.75-16

and 28hp, which were produced in 1939. Instead, a 16 hp overhead valve four-cylinder model has been introduced alongside the up-to-date versions of the Eight, Ten and Twelve with their L-head engines. The Sixteen, which was described in the Dec. 15, 1944, issue of AUTOMOTIVE AND AVIATION INDUSTRIES, will be almost identical to the Twelve except for the engines.

The four postwar Austin cars will closely resemble the models that had been prepared for 1940 and would have been exhibited at the cancelled London Show of October, 1939, but for the outbreak of war with Germany in September of that year. They will embody a number of detail improvements, some of which are of general interest. Among these is a new system of tensioning, silencing and lubricating the duplex roller chain driving the camshaft of both L-head and overhead valve engines. (The overhead valves of the Sixteen have pushrod operation.)

In a deep peripheral groove between the two rows of teeth of the camshaft sprocket an oil-resistant synthetic rubber ring is contracted; the outer surface of this ring extends beyond the base circle of the teeth and forms a cushion for the central link plates of the chain, thus silencing the latter and automatically tensioning it. Lubrication is effected as follows: From the front end of the adjacent camshaft bearing, oil at one point of each revolution of the camshaft exudes and is collected in two oil thrower plates riveted to the sprocket, one at each side, and thence is carried centrifugally to the side links of the chain.

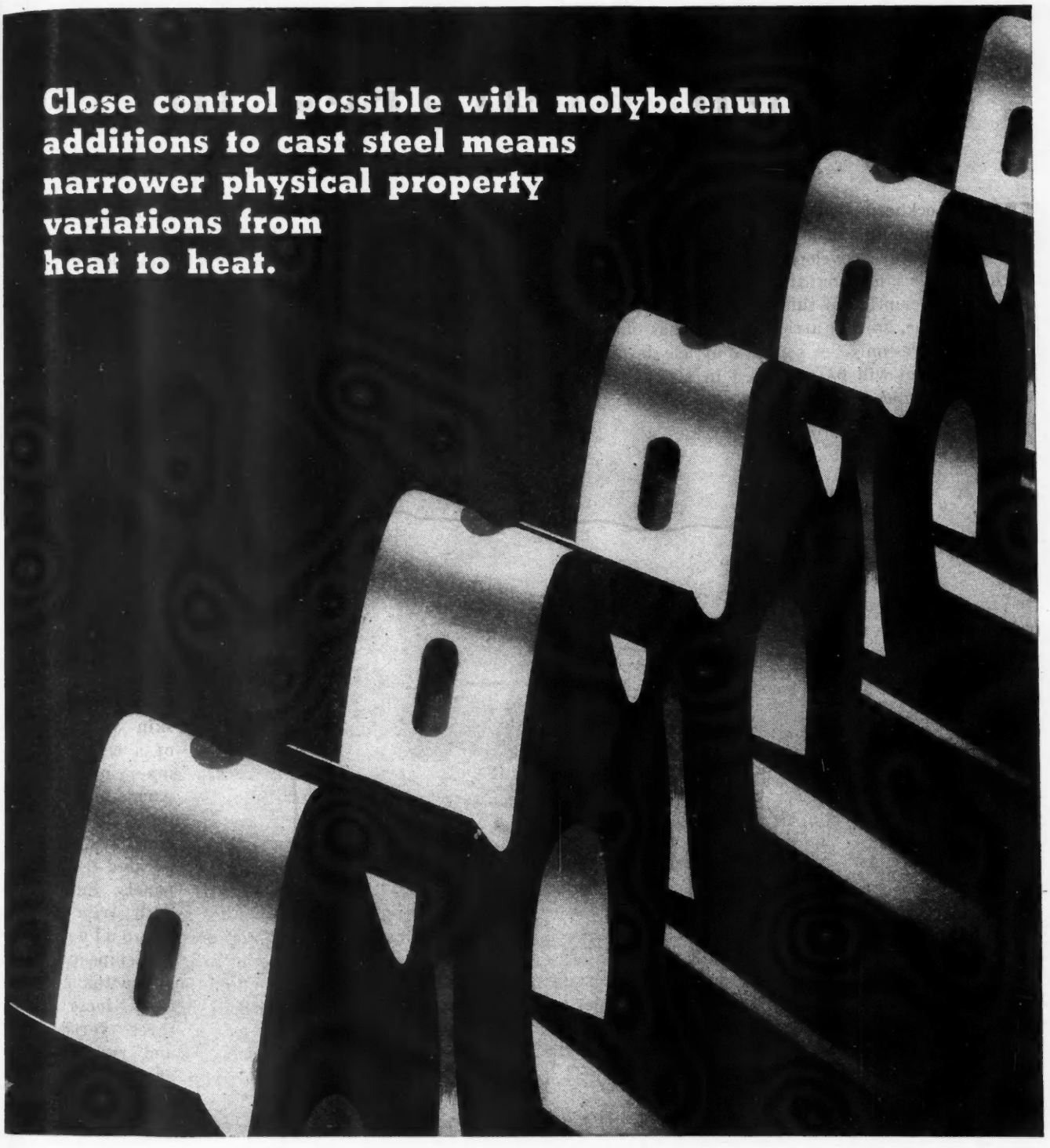
To afford better lubrication of the main journals of the crankshaft under heavy loading conditions, each bearing has oil led into it at four points uniformly spaced and leading from a groove around its outer surface, thus spreading it more effectively over the interior surfaces of the bearing. From the groove around the bearing liner oil is led also to the camshaft bearings; but, to prevent "starving" of the crankshaft bearings, the supply to the camshaft bearings passes through a gaged orifice, which restricts the rate of flow to a pre-determined maximum.

As in the case of the overhead valve Sixteen engine, the valve guides of the L-head engines are extended upward into the exhaust ports in the form of a shroud to give protection to the exhaust valve stems against the harmful effects of leaded fuel and to deflect the hot gases. The exhaust valves are made of high chromium steel, which gives greater resistance to corrosion than that of valve alloys hitherto used by the majority of British manufacturers.

All models, even the Eight, have a four-speed transmission with synchromesh on second, third and fourth. In the Twelve and the Sixteen a new feature of note is the addition of an outboard bearing supporting the rear end of an extended driven shaft. It is carried by a hollow casting, flange-bolted to the rear of the transmission casing. A cylindrical distance piece forms an oil trough running from the main rear bearing to the outboard one. The object of this outboard bearing, which shortens the propeller shaft by 4½ in., is to secure increased rigidity and quietude for the gears of the indirect ratios and to relieve the loading of the pilot bearing at the front end of the driven shaft. The main bearing previously was called upon to carry both radial load and thrust; it is now of a purely radial load type, the outboard bearing being of the dual purpose type.

The stationary countershaft, on which the bronze-bushed gear cluster rotates, has a flat formed along it on the side carrying no load. This flat allows oil to pass from end to end of the gear cluster interior and thus to the bearings, the oil entering the cluster through a hole between two of the gears. This arrangement supersedes spiral grooves cut in the bronze bushing and has been found more effective in carry-

(*Turn to page* 100, *please*)


Close control possible with molybdenum additions to cast steel means narrower physical property variations from heat to heat.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

500 Fifth Avenue • New York City

MOLY

Design Features of the L

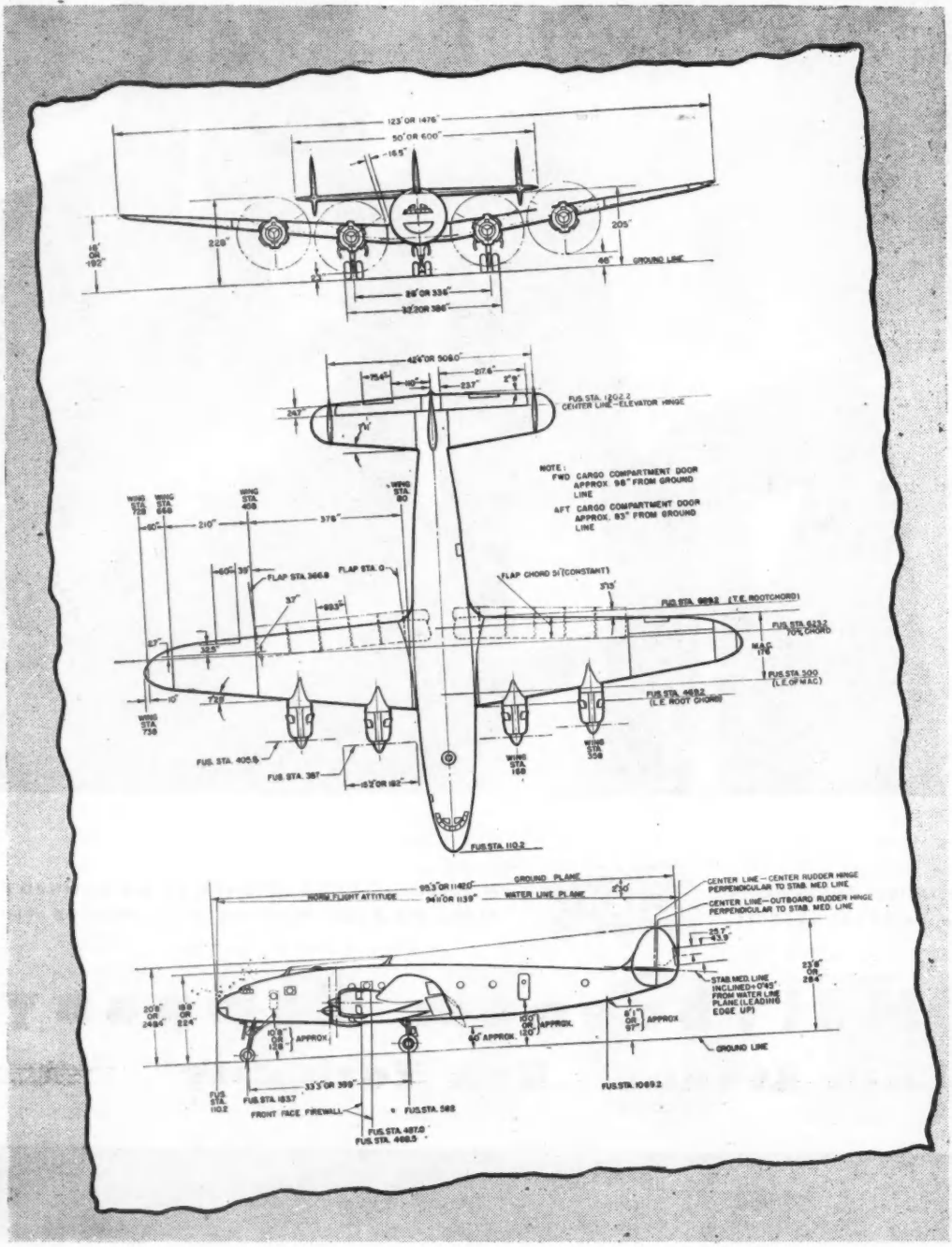
THE Lockheed Constellation is a history-making development. It is also the crucible in which many future developments have been refined by Lockheed's engineering and flight research staff. A complete description of this remarkable airplane would take a volume, so this article will discuss outstanding design features only. A separate article devoted to its control system will be published in an early issue of AUTOMOTIVE *and* AVIATION INDUSTRIES.

The Constellation is a high-speed, long-range, high-altitude transport airplane. It is powered by four 18-cylinder Wright Cyclone Duplex Engines developing over 2200 hp at takeoff rpm. The fuselage is of aluminum alloy, semi-monocoque construction. Passenger, crew and cargo compartments are pressurized and air conditioned. Cabin pressure is controlled by the flight engineer and maintains a pressure altitude of 8000 ft at actual altitudes up to 20,000 ft.

Accommodations are provided for 64 passengers. Alternative arrangements to accommodate various combinations of seated and sleeping passengers are available at the option of the operator.

The all-metal, full cantilever, stressed skin wing consists of a center section, inner panels, outer panels and wing tips. The nacelles and flaps are incorporated in the inner panels, the ailerons with trim tabs in the outer panels. The empennage is of all-metal construction, incorporating three vertical fins and rudders which are attached to the full-cantilever stabilizer.

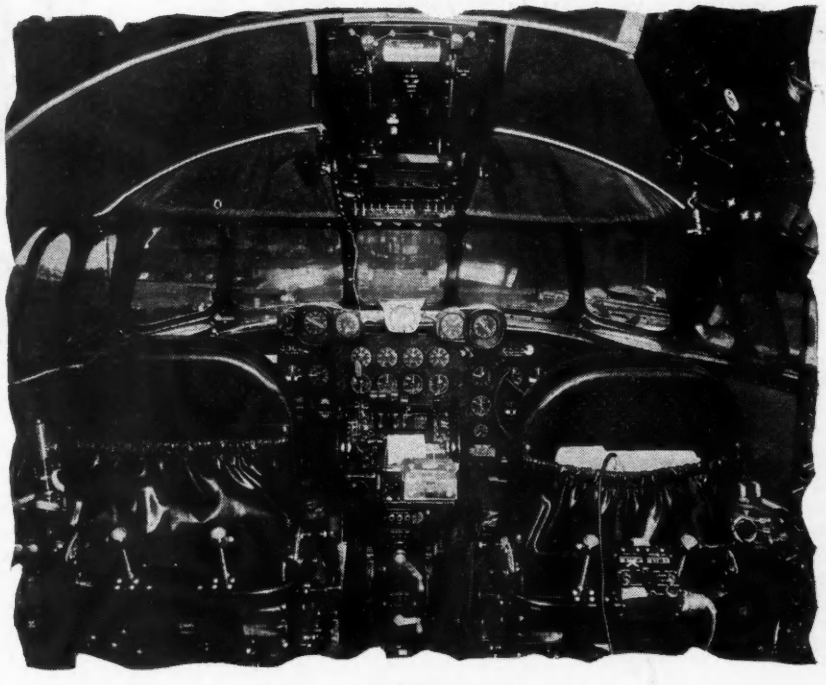
The hydraulically operated tricycle landing gear consists of a double-wheel steerable nose gear and two double-



The Lockheed Constellation
(Three view line drawings).

Lockheed Constellation

By
Clarence L. "Kelly" Johnson
Chief Research Engineer,
Lockheed Aircraft Corp.



Pilot's cockpit and controls.

wheel main gears. All gears are fully retracting and are completely enclosed by doors in the retracted position. A tail bumper is provided as a safety feature in the event of tail down landings.

The Constellation has a span of 123 ft, a length of 95 ft, one in. in normal ground position, and a height of 23 ft, eight in.

Lockheed's first high-speed, pressurized airplane was the XC-35, a development of the Electra twin-engine transport, which was built experimentally for the Army in 1937. Later emphasis on this development was dictated by the realization that future flight would be at altitudes where both passengers and crew would need either separate oxygen masks or the protection of a pressurized cabin.

The basic design of the Constellation was begun in 1939, and the project started with the layout of several ships and power plants, the original premise being the development of an aircraft capable of carrying a payload of 6000 lb and a crew of six a distance of 3500 miles at a cruising speed of between 250 and 300 mph.

Large engines were selected for the Constellation after an extensive study of available power plants. At cruising speeds heavy engines operating at a lower percentage of total power have considerably better specific fuel consumption. Therefore, in long flights, the saving in fuel more than makes up for the extra weight of the engines. The larger power plants running at a smaller fraction of their maximum output have a longer life and their great potential emergency power output gives a margin of safety that could be achieved in no other manner.

The selection of a multiple vertical tail arrange-

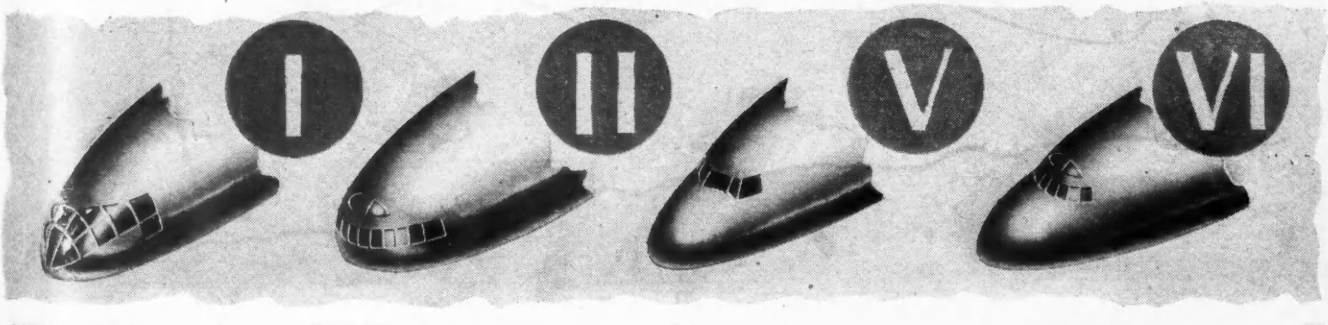
Some types of windshield studied during initial design stages.

Type I—Completely faired nose; cockpit above main floor. Discarded because of poor vision.

Type II—Required large fuselage nose that compromised the drag, but also had other obvious faults, such as danger in a water or gear-up landing, and resulted in a poor nose gear design.

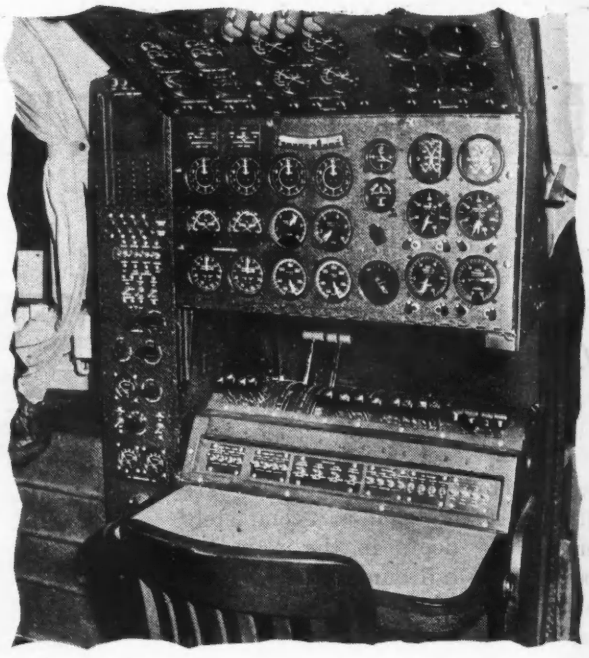
Type V—Conventional Vee windshield. Fuselage too big to give effective Vee so final design became Type VI.

Type VI—Conical type, incorporating numerous small panels, generated from a point above the airplane.



ment was made after an extensive study of the control problems involved in an airplane of the Constellation's gross weight using very large engines. The ship meets all CAR landing and stalling speed requirements and has good positive rudder control essential at critical low landing speeds. This has been achieved with the three vertical surfaces operated by a hydaulic booster system.

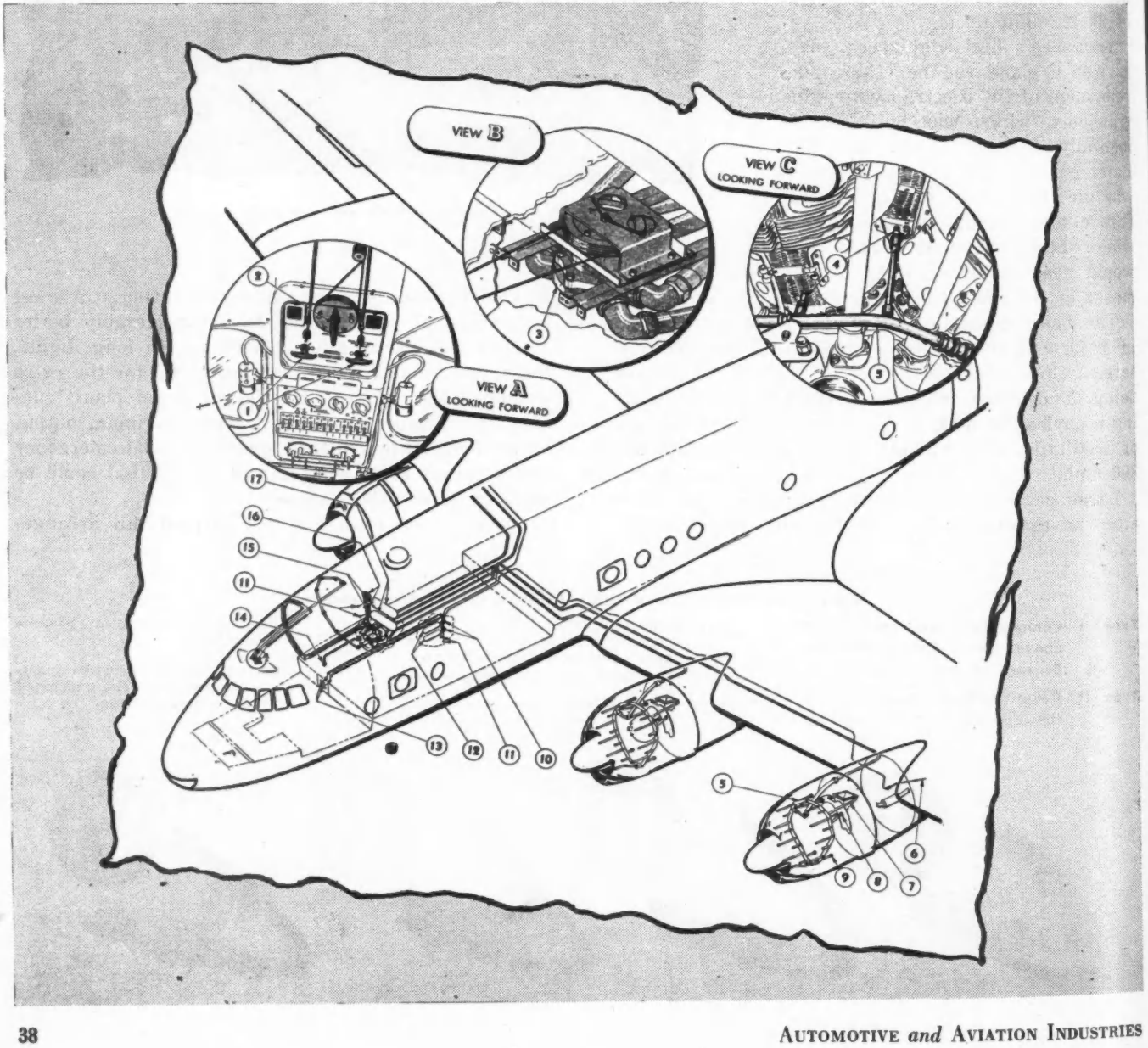
The Constellation's unusual fuselage arrangement has provided a very satisfactory drag coefficient. Because of the desirability of shortening the nose landing gear strut, the mean fuselage camber line was dropped for the forward section of the fuselage. A



Flight engineer's station and controls.

(Below) Fire prevention controls.

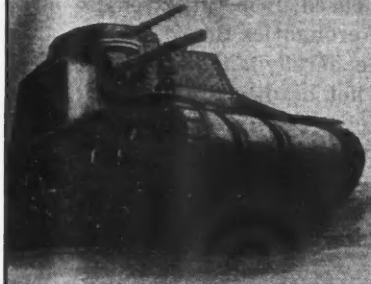
1—Pull handle (power plant system)
2—Control lever (selector valve)
3—Selector valve
4—Nozzle engine cylinder
5—Distribution ring
6—Nozzle (cabin heater)
7—Nozzle (carburetor air intake)
8—Nozzle (exhaust shroud)
9—Nozzle (accessory compartment)
10—Operating head (heater system)
11—Discharge indicator
12—Cylinder (heater system)
13—Pull handle (heater system
14—Ground connection
15—Operating head (power plant system)
16—Check valve
17—Cylinder (power plant system)
Vendor: American La France



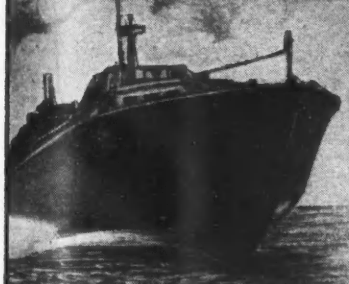
For pressure-tight... leak-proof unions!

Pressure-tight and leak-proof assemblies are of vital importance to the efficiency and proper maintenance of trucks, buses, planes, tanks, tractors, boats, diesel engines, pumps, pipelines and industrial machinery.

Permatex Form-A-Gasket No. 1 . . . Form-A-Gasket No. 2 . . . Aviation Form-A-Gasket and Pipe Joint Cement are as important as tools a mechanic uses to do the right job on gasket assemblies, flange unions, threaded connections, pipe joints and many other assemblies.



These Permatex sealing compounds are leak-proof to gasoline, kerosene, fuel oil, hot or cold lubricants, hot or cold water, salt water, illuminating gas, ethylene glycol, glycerine and numerous other liquids and gases.

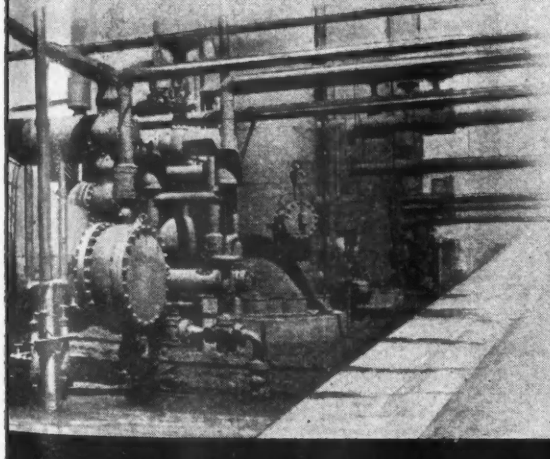


Permatex Form-A-Gasket No. 1 is a soft paste that dries fast and sets hard.

Permatex Form-A-Gasket No. 2 is a soft paste that dries slowly and remains pliable.

Permatex Aviation Form-A-Gasket is a heavy liquid that does not dry and does not run. Readily brushable and self-levelling.

Permatex Pipe Joint Cement is a heavy liquid that does not dry or crack. Applied with a brush. Permits easy readjustment. Disassembles readily.

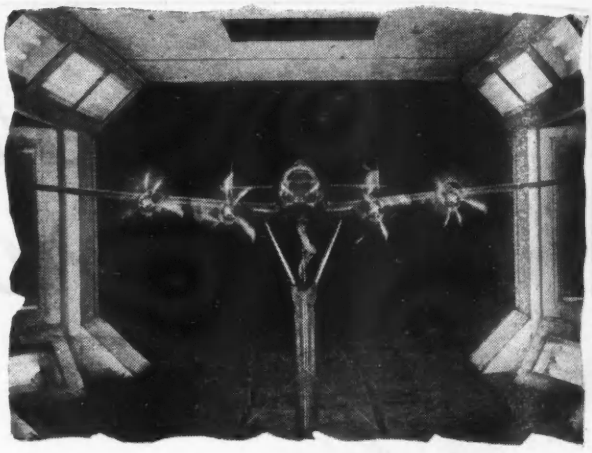


PERMATEX COMPANY, INC.
Sheepshead Bay, N.Y., U.S.A.

slight downward curvature aft of the wing reduced drag at the maximum lift-drag ratio of the airplane and gave the fuselage a basic shape corresponding to the mean flow line over the wing at cruising speed. The fuselage camber line rises again at the rear of the fuselage in order to obtain ground clearance.

When the Constellation was first laid out it was proposed to fair over a windshield having the basic contour of the fuselage itself, but the mockup showed that this design would afford poor visibility. Six windshield designs were developed and studied, of which five were mocked up. The design selected provided good visibility while fulfilling the structural requirements for pressure loads.

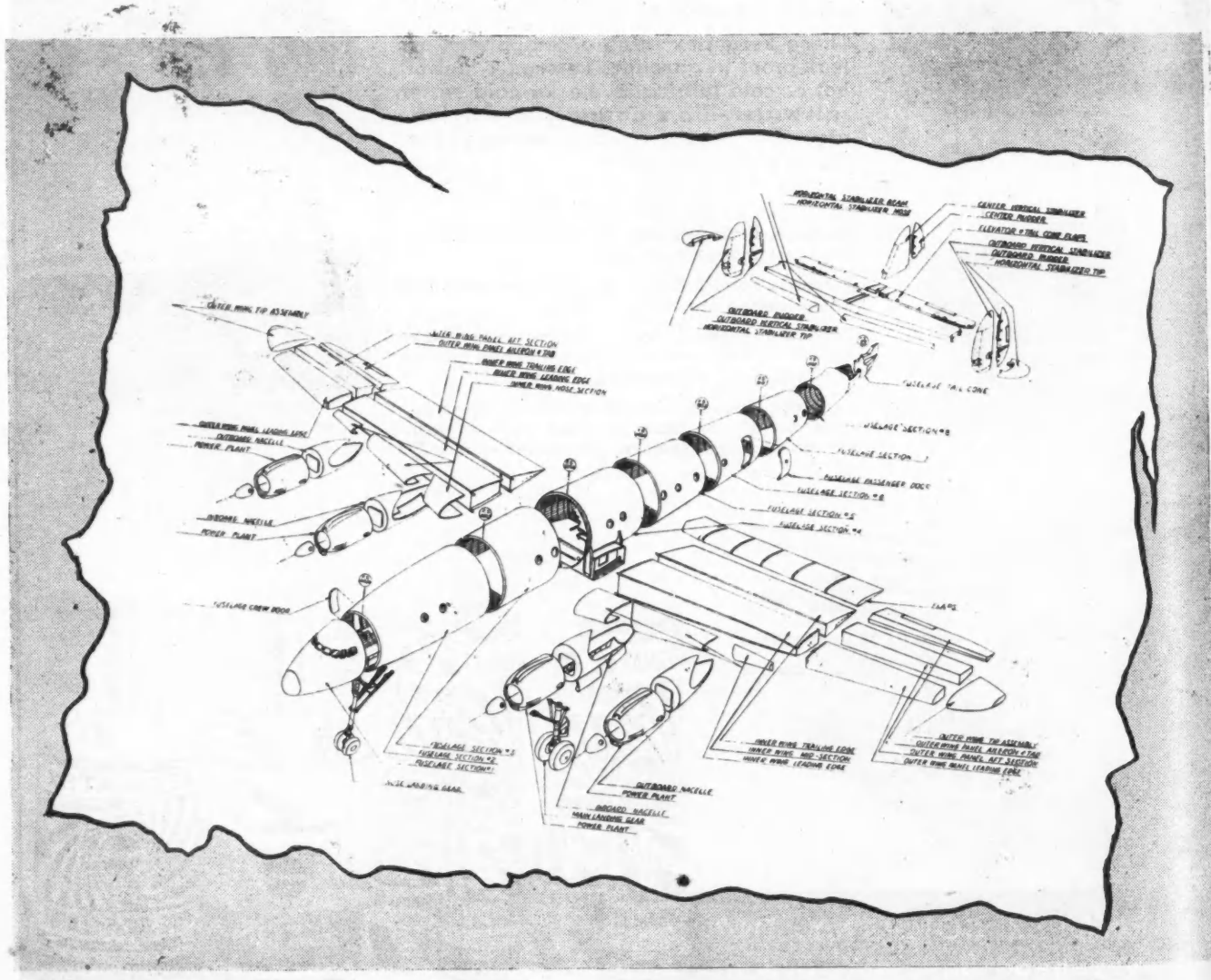
The Constellation is one of the first commercial transport airplanes to make provision for the full time services of a flight engineer. It was felt that the additional weight would be compensated for by obtaining optimum fuel consumption on long flights and by the increased safety afforded when the pilot is relieved of the necessity of operating engines, cabin superchargers and electrical controls. The flight engineer maintains close control of power and fuel flow in flight and also acts as flight inspector. Flying the Constellation is actually simpler than flying many smaller airplanes because of the presence of a flight engineer.



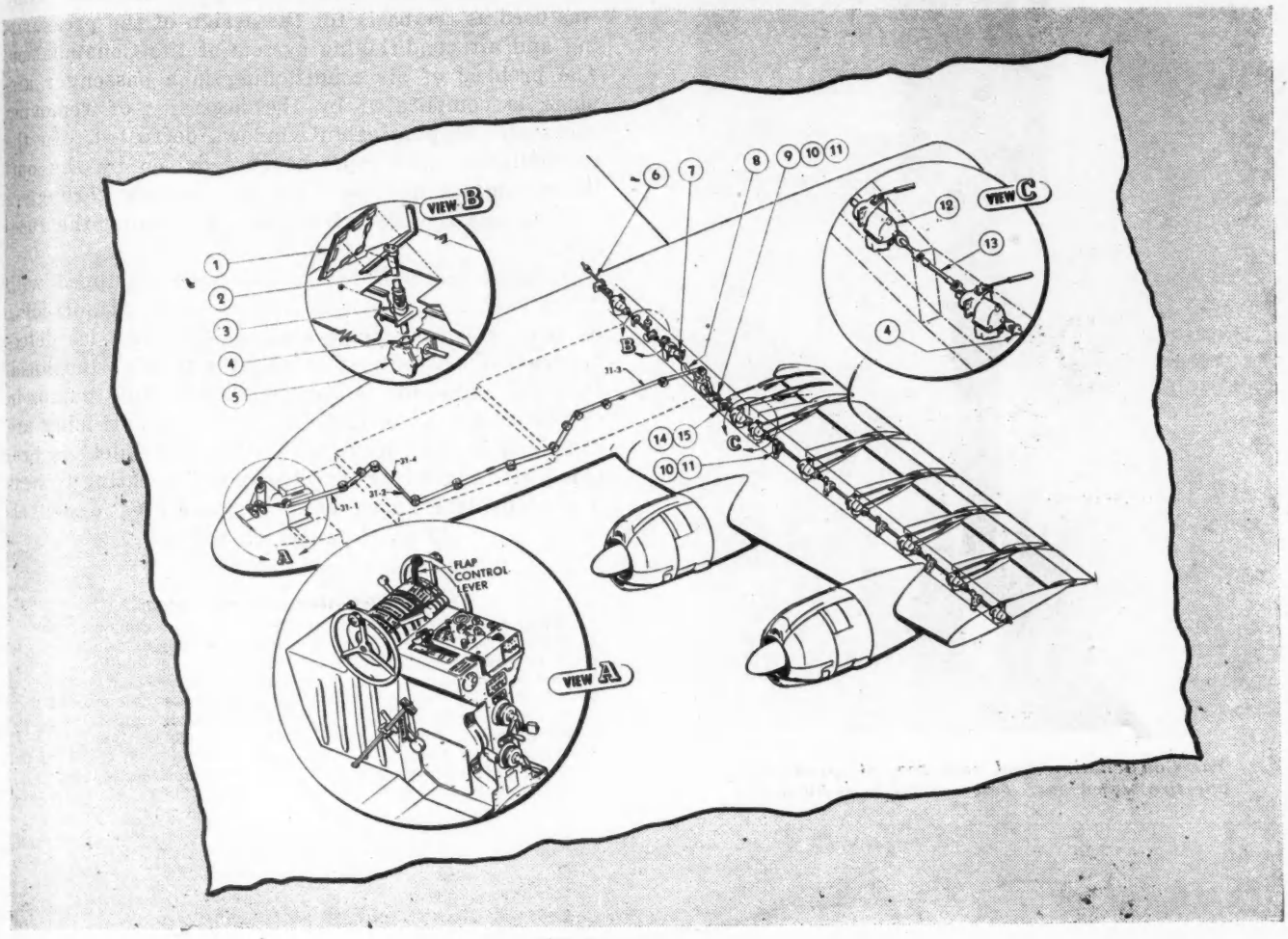
Nine-foot powered Constellation model in Lockheed's 300 mph wind tunnel.

One of the principal hazards of flying is fire so the Constellation is fitted with engine installations incorporating complete fire detection, fire warning and fire extinguishing devices based upon the extensive investigations of the Civil Aeronautics Board.

While details of the aerodynamic investigation of the Constellation will not be discussed here, it might



Sectional breakdown of the Constellation.



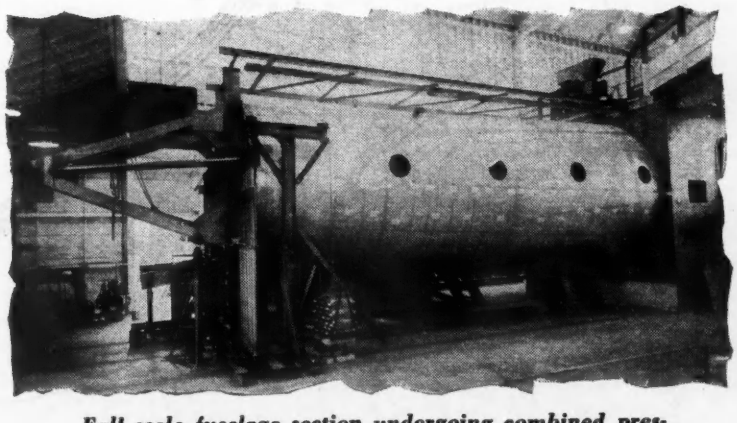
Details of flap control drives

Ref	Part	Vendor	Ref	Part	Vendor
1.	Emergency drive access panel	Lockheed	9.	Shaft seal (klozure)	Garlock
2.	Emergency flap drive handle	Lockheed	10.	Ball bearing	
3.	Ball bearing		11.	"O" ring packing	
4.	Flexible coupling		12.	Intermediate drive unit	Lockheed
5.	Emergency drive unit	Lockheed	13.	Universal joint assembly	Borg-Warner
6.	Universal joint assembly	Borg-Warner	14.	Sprocket housing assembly	Lockheed
7.	Main drive unit	Lockheed	15.	Ball bearing	
8.	Flap control mechanism	Lockheed			

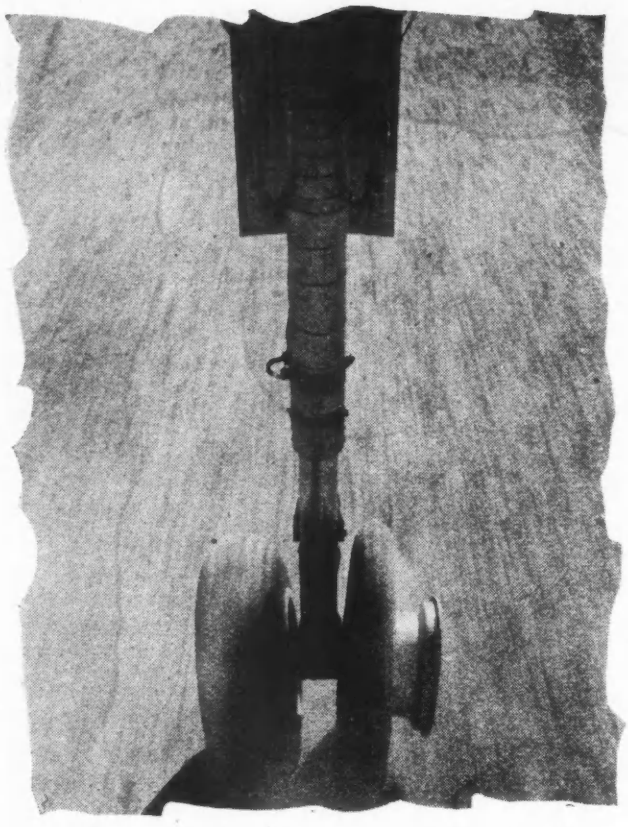
be interesting to note that complete tests, covering every major element of the airplane, were run in six different wind tunnels including the NACA "spin" tunnel. So complete were the data on such problems as stability, stalling and control that corrections were made in the early stages of design and not one external change had to be made in the airplane to correct aerodynamic difficulties.

Structural tests, including destruction tests on most of the major elements of the airplane, were made during the design period. At this time such failures as occurred were corrected. Simulated operation against test loads were made of many elements, such as the wing flaps, to insure proper service life. Perhaps the most elaborate phase of the pre-flight testing of the Constellation was the construction of a full scale hydraulic mock-up to develop all phases of the system including hydraulic boosters, landing gear, flaps, pumps, brakes, automatic pilot and the complete plumbing arrangement. While laboratory tests obviously cannot be wholly effective, it was found that the hydraulic mockup provided about 95 per cent of the information on flight conditions and gave an opportunity to abuse deliberately the various systems.

Experience gained earlier in the development of the



Full scale fuselage section undergoing combined pressure, bending and torsion tests. Stresses were measured by hundreds of electric strain gages.



The Constellation dual nose gear at speed with one tire blown out. Test was made at 80 mph.

experimental pressurized cabin plane for the Army was used as the basis for the design of the pressurizing and air conditioning system of the Constellation. The problem of air conditioning in a passenger airplane is complicated by the necessity of removing odors and keeping cabin windows defrosted. In the Constellation dual superchargers driven by the outboard engines are used, the air passing through a heating and cooling system before reaching the fuselage.

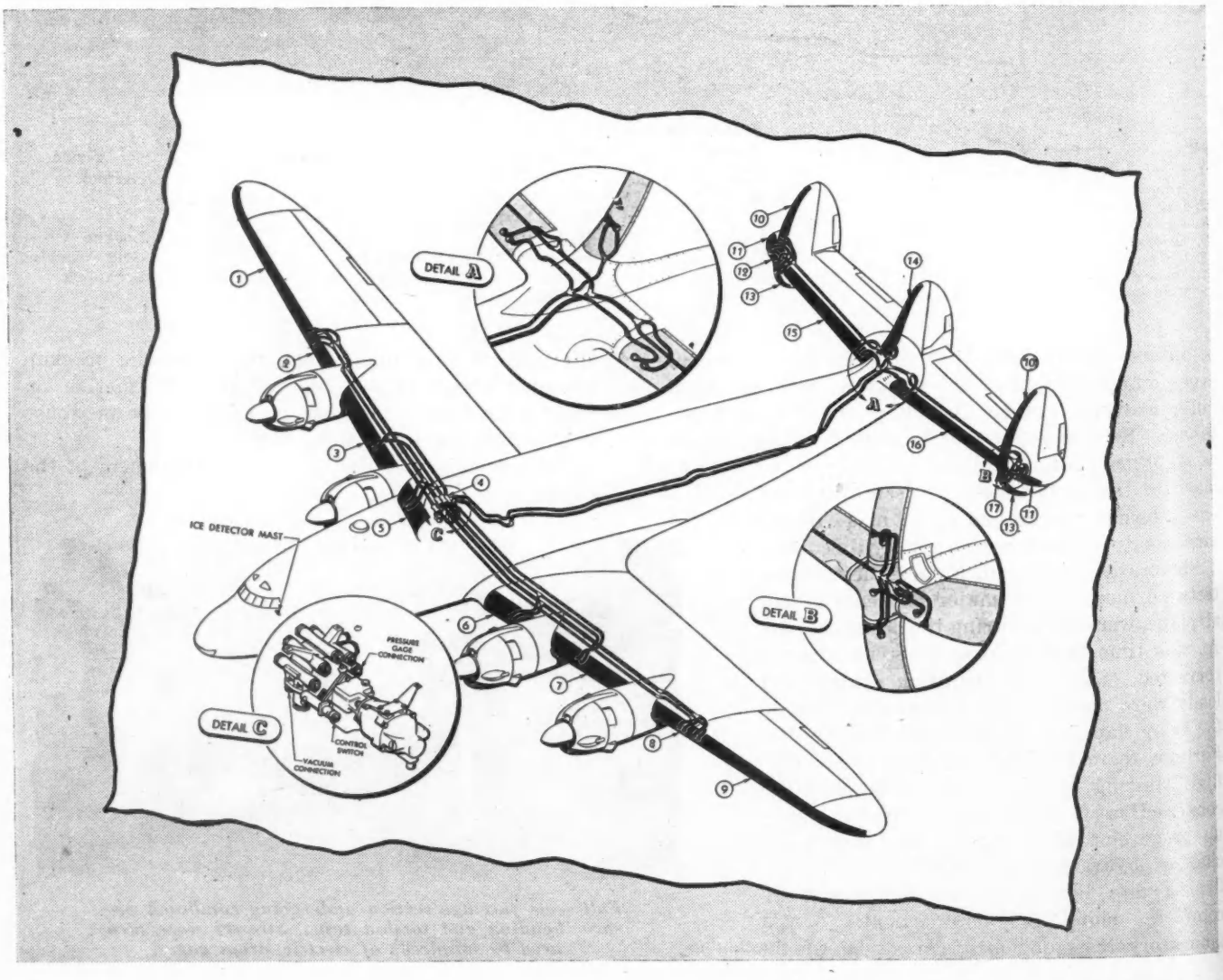
Although early Constellations were equipped with deicer boots, later models will use thermal anti-icing on wing and empennage leading edges. An ice detector mast is located just outside the pilot's windshield. Propeller anti-icing is accomplished by fluid pumps in the outbard nacelles and fluid and heat anti-icing are combined in the carburetors. The windshield is provided with two wipers and has electric heating to heat the windshield above icing temperatures under all

(*Turn to page 92, please*)

The Constellation deicing system.

1—Wing deicer boot
2—Wing dicer boot
3—Wing dicer boot
*4—Distributor valve
5—Wing deicer boot
6—Wing deicer boot
7—Wing deicer boot
8—Wing deicer boot
9—Wing deicer boot
10—Fin deicer boots
11—Stabilizer deicer boots
12—Cross deicer boot
13—Fin deicer boots
14—Fin deicer boot
15—Stabilizer deicer boot
16—Stabilizer deicer boot
17—Cross deicer boot

Vendor: B. F. Goodrich Co.
(*Vendor: Eclipse)



protect metal parts in every stage . . .

Protecting precision machined metal parts against damage during storage, shipment, and handling is a major problem.

The task has been tremendously simplified by Stripcoat—efficient plastic packaging material which has made possible an average saving of 80 per cent in manhours. Dip the part in hot Stripcoat and it is instantly sealed in a water-tight "skin." Ship it, handle it, put it in storage—it remains protected. Whenever you wish, slit the Stripcoat wrapper, strip it off, and the part emerges clean, uncorroded, unmarred.

Dow technicians in twelve sales offices will be glad to discuss the properties* and possibilities of Stripcoat.

Stripcoat

DIP IT SHIP IT STRIP IT

PRESENT AND POTENTIAL USES: For coating gears, crankshafts, and similar metal, precision-machined parts of various sizes, shapes, and descriptions.

PROPERTIES AND ADVANTAGES:* Essential ingredient is Ethocel (Dow Ethylcellulose). Provides protection against corrosion, dust, scratches, and handling for an indefinite period. Quickly applied, easily removed. Stripcoat parts will not adhere to each other. Retains protective qualities from -30° to 150° F. Withstands 100% relative humidity at 120° F. Highly resistant to salt solution.

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago
St. Louis • Houston • San Francisco • Los Angeles • Seattle

DOW

PLASTICS

STYRON • STYRALOY • ETHOCEL • ETHOCEL SHEETING
SARAN • SARAN FILM • STRIPCOAT

War Production Cutbacks Not So Great as Formerly Predicted

Army Apparently Trying to Hold Production Up to Very Near the Pre-VE Day Level During the Balance of 1945

Although cutbacks in war production have not come as fast as hoped for by the automobile industry after the first flurry which began before V-E day, it still is expected that reduction in output of war goods this year will taper off to about the 15 per cent cutback predicted before the war with Germany ended. The reason for the slowing down of cutbacks is that the Army apparently is battling to hold production up to very near the pre-VE level during the rest of this year. It is true that there have been some sizable cutbacks in aircraft, tanks, and other weapons of war, but the total overall effect as yet has not been as great as predicted formerly.

There is reason to believe that one reason for this is that the military has not yet fully decided what its needs will be for the Japanese war and what can be salvaged for use there from the European theater. When these two factors are determined, there may be sudden and drastic cutbacks in war production at home. Undoubtedly, that is why WPB is going ahead with plans for resumed civilian production, since it probably believes that during the last half of this year war production will fall off to a point where the home economy must be geared to take up the slack of large-scale unemployment.

Meanwhile the piecemeal cutbacks in the automotive industry are slowly but steadily freeing up plant space and manpower for resumed production of cars. The announced closing of the Willow Run bomber plant by June 30, a month ahead of the previous termination date, will make available all the manpower Ford needs to revamp his plants, if any is needed, which is doubtful in view of the manpower surplus which now exists in Detroit. Ford, incidentally, appears to be ahead of the parade, in that the company recently released pictures of its 1946 model Ford, which was hand-built and already has been tested.

Termination of contracts for production of two aircraft instruments at the Ternstedt Mfg. Div. of General Motors has a more direct and beneficial effect. T. P. Archer, vice president of G.M. and general manager of the Fisher Body Div., has announced that the plant will start production of automobile body hardware early in July. In line with the policy of concentrating war work as much as possible, fabrication of cloth-covered surfaces for the B-29 rudder, elevator, and aileron assemblies will be transferred from the Fisher Lansing, Mich., Div. to the Fisher Memphis Aircraft Div. Assembly fixtures will be moved from Lansing, with operations to begin in July. The Memphis plant recently was awarded additional war work on the B-29, so it undoubtedly will be lost to G.M. for some time in any event. Another G.M. division, Grand Rapids Stamping, has been informed that its contract for 155mm, M-107 shells has been terminated. On the other hand, the St. Louis plant of Chevrolet Div. has just completed its first million 105 mm. howitzer shells and output is continuing at the rate of hundreds of thousands per month. Consequently, it appears that G.M. production facilities in the Detroit area are being cleared first and that production of automobiles in the early reconversion period, at least, will take place there. Chevrolet is understood to be planning to concentrate as much as possible of its aircraft work at its Buffalo plants to clear work space at Flint.

DeSoto Div. of Chrysler Corp. is getting out from under one of its war contracts. During the next five months, the job of building center wing sections will be shifted to the Curtiss-Wright plant at Columbus, Ohio. However DeSoto will continue to make stampings for the Helldiver. It also is still tied up with work on the B-29 nose section. Chrysler also has received word from the War Department that it will be honorably discharged August 30 from

(*Turn to page* 94, *please*)

Producers Confident That Steel Will Be Available for Automobiles

Production of 200,000 Cars Will Require Only About Five Per Cent of Normal Peacetime Steel Consumption

By W. C. Hirsch

Fenced in as the metal markets continue to be by restrictions of one sort or another, there isn't much likelihood that commitments for the materials required in the production of the authorized 200,000 passenger cars in the current year will shed any light on what price set-up consumers will have to face in the post-war period. What easing of WPB regulations has been announced or is contemplated will not effect OPA's sway over ceiling prices and this, it must be assumed, will be the determining factor in shaping the market's complexion, at least until the defeat of Japan has been accomplished. With the War Labor Board being importuned by union spokesmen to lift steel workers' wage scales higher and higher, the stabilizing of prices over even a relatively brief period of time becomes a more Herculean task than it has been. The adjustments in ceiling prices that were sanctioned by OPA in May, failed to allay discontent in a wide section of the steel industry, especially of those who depend for their supply of semi-finished steel on more fully integrated mills.

Market gossip leans heavily these days on the large number of tentative inquiries being received for sheets and strip steel from automobile and parts manufacturers, but a sense of proportion rules out acceptance of this as denoting more than a desire to keep posted on the reaction of individual steel companies to commitments at this time. After all, the volume of business that overhangs the steel market as the result of the authorization of the production of 200,000 cars is only around 5 per cent of what has come to be looked upon as normal annual peacetime consumption. The steel industry as well as producers of other metals needed no reminder that war requirements would be accorded absolute priority as the basic condition of gradual resumption of civilian materials output.

Many of the leading steel producers are confident that the fullest coverage of Army and Navy requirements in the war on Japan, plus Lend Lease allotments, will leave enough steel over to take care of the automotive industry's limited 1945 needs. The uncertainties of war are, however, not being lost sight of, and the possibility of the

(*Turn to page* 50, *please*)

At your service when Nazi and Jap surrender

The engines of war continue to require millions of Sealed Power Piston Rings. But after VE-Day and VJ-Day, the largest and best facilities in all 33 years of Sealed Power history will be at your service. Meanwhile, Sealed Power engineers invite you to use their experience and the unequalled resources of Sealed Power laboratories to help make your good engines even better.

SEALED POWER CORPORATION
Muskegon, Michigan · Windsor, Ontario

BUY *MORE* WAR BONDS
—AND *KEEP* THEM!
Pay $3—Get $4!

SEALED POWER PISTON RINGS

PISTONS—CYLINDER SLEEVES

General Motors Plans For New Car Production

General Motors expects to build about 95,000 cars during the last part of this year under the national quota of 214,000 automabiles set by WPB, according to Alfred P. Sloan, chairman. At the Corporation's annual meeting, Sloan warned that the public should not expect a $500 car, but added that the new light Chevrolet would be priced as low as possible.

It will be at least two years before any radically new streamlined models will appear on the market, he said, since government authorization to use planning engineers and technicians on new designs has come only in recent weeks.

Wood Appointed Chief Engineer at Chevrolet

John G. Wood has been appointed chief engineer of the Chevrolet Motor Division, it was announced by M. E. Coyle, Chevrolet general manager and vice president of General Motors. Coyle disclosed at the same time, that Edward H. Kelley has been named assistant chief engineer. Both appointments were made to fill vacancies created when J. M. Crawford, who had been head of the Chevrolet engineering organization for more than 16 years, and who is president of the Society of Automotive Engineers, left to become assistant to C. L. McCuen, vice president in charge of the engineering staff of General Motors.

Obituary

E. R. Fellows, 80, founder and president of the Fellows Gear Shaper Co., died suddenly at his home in Springfield, Vt., May 21.

William L. Dankmyer, 67, assistant treasurer of the Allegheny Ludlum Steel Corp., died May 27 at his home in Aspinwall, Pa.

Alfred Marshall, for many years employment manager of the Chevrolet motor division in Detroit and Flint, died May 17 at Tucson, Ariz.

Robert H. Darnton, 62, for the past 15 years superintendent of the Buick Forge Plant, died May 27 at his home in Flint, Mich., following several weeks' illness.

Donald J. Hutchinson, 49, assistant treasurer of the Chrysler Corp., died suddenly May 31 at San Francisco.

C. S. Morey, associated with the Machine and Small Tools Divisions of the Barber-Colman Co. since 1906, died May 21 at Lansing, Mich.

Knudsen Resigns from Army

Lt. General William S. Knudsen, former president of General Motors, has resigned from the Army. The resignation became effective June 1. For his services in directing production work for the Army, he has been awarded the oak leaf cluster to the Distinguished Service Medal, the highest award for non-combat duty. He has not announced whether he will return to General Motors or engage in some other business activity.

PUBLICATIONS

Practice in Machining Zinc Die Castings, a compact handbook, has been published by The New Jersey Zinc Co. It presents in interesting fashion an outline of the latest practice for the entire gamut of metal cutting techniques. Among the topics covered are, broaching and shaving, drilling, end milling, hollow milling, turning and boring, swaging, threading, etc. Photographs and sketches are used to illustrate machine setups and tool forms.*

A new 8-page booklet, ETR-7, on General Electric Co.'s **disk-seal electronic tube,** has been announced by the Tube Div. of the company. The pamphlet describes the basic principles of design and operation of the tube and its advantages in the fields for which it is designed.*

Motors and Controls for Hazardous Locations is the title of a booklet by General Electric Co. It discusses hazardous locations in industry and recommendations as to the applications of equipment and a summary of major types of GE equipment for this purpose.*

Johns-Manville Products for the Aviation Industry is the title of a 12-page booklet published by Johns-Manville. It provides information on many asbestos materials which are adaptable for use in aircraft manufacture and operation, as well as in airport construction. Packings, gaskets and seals, asbestos tubings and textiles, friction materials, insulations, sound-deadening materials are a few of the products discussed. Technical information and weight factors are also included.*

The American Manganese Steel Div. of the American Brake Shoe Co., has issued bulletin 345-W on **Amsco Toolface,** a new welding rod developed to save time and reduce costs in making, salvaging and altering cutting tools, and for hard-surfacing operations where extreme hardness and resistance to shock and corrosion are required.*

The Lubriplate Div. of Fiske Brothers Refining Co. has issued a new 1945 **Lubriplate Service Handbook,** containing useful information on the subject of lubrication. The development of Lubriplate is discussed, together with the various types of Lubriplate lubricants, applications and Lubriplate recommendations.*

A 22-page booklet on the **Lonn rubber blow and spray guns and water savers** has been published by The B. F. Goodrich Co. The booklet explains the principle of the Lonn valves and includes charts which show the cost of air or water delivered through various sized orifices when uncontrolled.*

Fairbanks-Morse has issued two new folders, one on Figure 6920, **Oil Lubricated Turbine Pumps** with enclosed impellers and the second, **Niagara Propeller Pumps,** Figure 6310. Both folders are illustrated.*

Clark Tructractor has published a 24-page pictorial materials handling news bulletin called **Pallets, Solution to Materials Handling.** Several types of pallets currently used for different types of material are illustrated.*

The American Rolling Mill Co. has published a new 24-page booklet, **Armco Low-Alloy High Strength Steels,** describing Armco High-Strength Steels. There are sections on drawing, forming and welding, in addition to data on various designs.*

Simmonds Aerocessories, Inc., have issued a revised edition of the Handbook of Engineering Design Data on the **Simmonds Precision-Built Push-Pull Controls.** The operating principles of the push-pull control are given in the handbook, together with data summarizing exhaustive tests conducted under the auspices of the AAF and Navy.*

* Obtainable by subscribers within the United States through Editorial Dept., AUTOMOTIVE *and* AVIATION INDUSTRIES. In making requests for any of these publications, be sure to give date of the issue in which the announcement appeared, your name and address, company connection and title.

1945 Commercial Truck Program*

The War Production Board announced commercial truck production quotas totaling 233,472 units for 1945 have been allocated to truck manufacturers. The quotas by companies are as follows:

Manufacturer	Light	Medium	L. H.	H. H.	Off-Highway	Total
Autocar	.....	.....	2,059	1,993	.....	4,052
Available	.....	16	23	4	.....	43
Biederman	.....	2	5	.....	.....	7
Brockway	.....	301	1,052	867	.....	2,220
Brown Equipment Co.	.....	.....	.....	23	.....	23
Caterpillar	.....	.....	.....	.....	175	175
Chevrolet	13,517	48,795	.....	.....	.....	62,312
Corbitt	.....	.....	228	203	.....	431
Dart	.....	8	16	16	68	108
De Martini	.....	.....	7	.....	.....	7
Diamond T	.....	3,406	1,421	144	.....	4,971
Divco	.....	1,712	.....	.....	.....	1,712
Dodge	6,557	14,055	1,162	.....	.....	21,774
Duplex	.....	.....	4	28	.....	32
Euclid	.....	.....	.....	.....	487	487
Federal	.....	1,314	1,704	160	.....	3,178
Ford	12,649	41,188	.....	.....	.....	53,837
Four Wheel Drive	.....	.....	269	393	86	748
GMC Truck and Coach	2,106	8,773	5,360	1,640	.....	17,879
Hendrickson	.....	.....	58	26	12	38
International Harvester	4,944	14,408	12,323	967	24	32,666
Kenworth	.....	.....	.....	239	95	334
Koehring	.....	.....	.....	.....	56	56
Linn	.....	.....	.....	16	.....	16
MacDonald	.....	.....	15	6	.....	21
Mack	.....	1,074	3,794	1,810	192	6,870
Marmon-Herrington	.....	.....	58	58	.....	58
Oshkosh	.....	.....	21	182	36	239
Peterbilt	.....	.....	.....	208	100	308
Reo	.....	3,780	430	48	.....	4,258
Sterling	.....	.....	45	528	91	664
Studebaker	.....	4,000	.....	.....	.....	4,000
Walter	.....	.....	89	188	8	285
Ward LaFrance	.....	.....	.....	112	.....	112
White	.....	1,349	7,359	596	.....	9,304
Willys-Overland	227	.....	.....	.....	.....	227
Total	40,000	144,181	37,444	10,417	1,430	233,472

* The above quotas do not include an additional 188,700 trucks authorized for the second half of 1945, company quotas for which have not been assigned by the War Production Board.

SECTION THICKNESS

In die castings, sections should be of minimum thickness consistent with ease of casting and with adequate strength and stiffness, because:

1. *This minimizes the weight of metal required, helping to lower cost.*
2. *Thin sections cool rapidly in the die, helping to shorten the casting cycle.*
3. *Thin sections are stronger, in proportion to their thickness.*
4. *Surface smoothness is apt to be better than on heavier sections.*

Many zinc alloy die castings are as thin as stampings and are easily made stiffer and in more complex shapes than feasible in one-piece stampings—witness the above zinc alloy die cast washing machine wringer frame with wall sections as thin as .045".

For more detailed information on this and other considerations which will enable you to get the most for your die casting dollar, ask us—or your die casting source—for a copy of DESIGNING FOR DIE CASTING.

ZINC
FOR DIE CASTING ALLOYS

The New Jersey Zinc Company, 160 Front St., New York 7, N. Y.

The Research was done, the Alloys were developed, and most Die Castings are specified with
HORSE HEAD SPECIAL (99.99 + % Uniform Quality) ZINC

PERSONALS

Consolidated Vultee Aircraft Corp., **R. L. Musson,** Asst. Div. Mgr., and **F. L. Farrell,** Chief of Contracts.

General Motors Corp., **F. L. Burke, W. G. Lewellen** and **Frank R. Pierce,** elected vice-presidents. Fisher Body Kansas Div., **Clarence A. Trump,** Resident Mgr. Chevrolet Motor Div., **William J. Scott,** Asst. General Mfg. Mgr. **J. L. Connell,** Mgr., Mid-West Region, Headquarters at Kansas City; **I. X. Sarvis,** Mgr. Southwest Region, Headquarters at Dallas. Buick Forge Plant, **Roy I. MacArthur,** Supt.

General Motors of Canada, Ltd., **R. S. McLaughlin,** Chr. of Board, **William A. Wecker,** Pres. and Gen. Mgr.

Morse Chain Co., **Frank M. Hawley,** elected to Board of Directors, is a Vice-Pres. and formerly mgr. of the Detroit plant. **Stanley B. Waring,** elected secretary and treasurer.

Sperry Gyroscope Co., **Stanley W. Bedell,** Export Sales Mgr.

Westinghouse Electric Corp., Aviation Gas Turbine Div., **Frederick W. Rohde,** Mgr. Quality Control Div.

The B. F. Goodrich Co., **L. R. Keltner,** Supt. of Akron Plant. **T. U. Blake,** Chief Engineer, The B. F. Goodrich Chemical Co.

The Goodyear Tire & Rubber Co., **R. W. Richardson,** Manager of new Aviation Products Div.

Graham-Paige Motors Corp., **T. J. Manning,** General Controller. **Harry D. Dodge,** Director of Foreign Sales.

Bendix Helicopter, **Claire L. Barnes** elected President.

Curtiss-Wright Corp., **Julia M. Scanlan,** elected Secretary, **R. J. Lindquist,** Treasurer. **Ed Grayson, staff asst.,** Sales Publicity and Promotion Dept., Airplane Div., St. Louis Plant.

Automotive Council for War Production, **Harvey C. Fruehauf,** elected a director.

Mack-International Motor Truck Corp., **Harold Connor,** Mgr., Sales Dept., Bronx and White Plains Branches.

Briggs Clarifier Co., **George S. Garrard,** Chief Engineer.

Osborn Mfg. Co., **Robert Wier, Jr.,** General Sales Mgr., Brush Div.

E. I. duPont deNemours & Co., Inc., Fabrics Div., **E. S. Nickerson,** Asst. General Mgr. Finishes Div., **Dr. H. H. Hopkins,** Mgr., **Matt Denning,** Asst. Mgr. Electrochemicals Dept., **Albert R. Tucker,** West Coast Manager.

The Denison Engineering Co., **Lonnis Denison,** Vice-Pres. and Asst. Gen. Mgr., **Frank C. Norris,** Vice-Pres. in Chg. of Mfg. and Eng.

The Fostoria Screw Co., Sub. of Bowser, Inc., **Frank H. Higgins,** President.

Rigid-Tex Corp., **Richard S. Smith,** Pres.; **Hubert L. Perry,** Vice-Pres. and Treas.; **William J. McArdle,** Gen. Sales Mgr.; **John E. Emerson,** General Mgr.; **R. Kemp Slaughter, Jr.,** Chief Eng. and **Eugene P. Thomas,** Mill Supt.

Jacobs Aircraft Engine Co., **J. Story Smith,** formerly vice-pres. and secretary has resigned.

United States Rubber Co., **G. Al Wood,** Pacific Coast Fisk Sales Mgr., with headquarters in Los Angeles, Tire Div., **Ira S. Shull,** Los Angeles U. S. Rubber Co. plant.

Penn Metal Corp. of Penna., **Lt. Col. Hubert E. Snyder,** Vice-Pres.

Penna. Salt Mfg. Co., **Ethel S. Klingman,** Mgr. of Advertising. Special Chemicals Div.; **John J. Lance,** Field Representative.

Basca Mfg. Co., Inc., **Thos. Henderson,** Asst. Sales Mgr.

Chrysler Export Corp., **C. B. Thomas,** Pres., has been appointed member of Major General J. S. Hatcher's Comm. to study automotive situation in Europe. **Col. John B. Trainer, Gen. Mgr.,** China Service Contract and **Wendell H. Welch, Mgr.,** Executive Div. of the Contract in Detroit.

Society of Automotive Engineers, **M. LeRoy Stoner,** Staff Engineer, Aeronautics Dept.

Koebel Diamond Tool Co., **Dr. Harry Whitaker,** head of Research Dept.

The Studebaker Corp., **Frank T. Corcoran,** and **J. A. Grenier,** special representatives.

Pack-Rite Machines, **Gladys A. Techtmann,** in charge of National sales.

Quaker Chemical Products Corp., **Dr. David M. Gans,** Technical Director.

Aeronautical Chamber of Commerce of America, **William T. Piper, Jr.,** Chr. and **Carl Friedlander,** Vice-Chr., of Personal Aircraft Council.

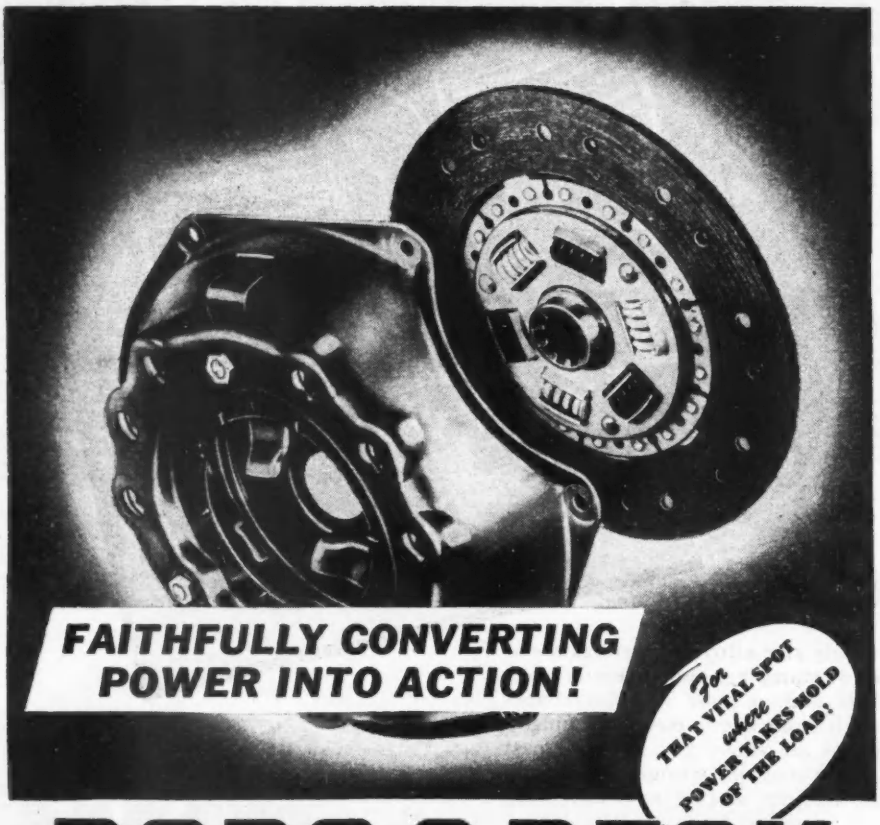
Hood Refining Co., **Rowe D. Staub,** Sales Mgr.

Chrysler Corp., DeSoto Div., **J. E. Paddock,** Boston Regional Office. **N. B. Bush,** Memphis office with headquarters in New Orleans. **N. B. Spalding,** Syracuse office. **C. T. Leary,** Philadelphia office.

Basic Fuel Ration Restored in England

The basic fuel ration for passenger cars used in private service in England, which was withdrawn in 1941, has been restored as from June 1. It is a meagre allowance, representing a mileage of only 100-120 miles per month. On the same date the control of tires was partially relaxed, making it no longer necessary to obtain a permit to buy part-worn or reconditioned casings or to have the latter retreaded. New tire sales remain under full control as hitherto.

WITH EVERY ARMORED DRIVE



FAITHFULLY CONVERTING POWER INTO ACTION!

For THAT VITAL SPOT where POWER TAKES HOLD OF THE LOAD!

BORG & BECK

The Standard Clutch in Peace or War!

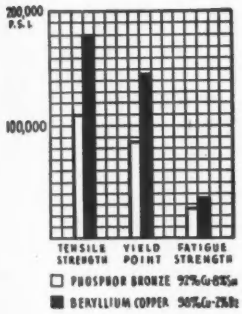
New Engineering Manual now Available on Request

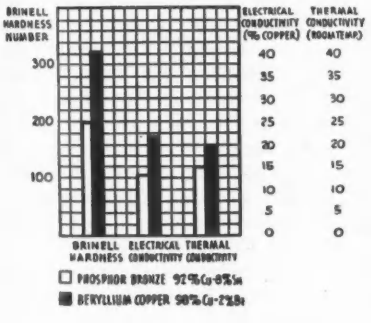
BORG & BECK DIVISION
BORG-WARNER CORPORATION
CHICAGO ILLINOIS

BERYLLIUM-COPPER SCREW-BLANK MACHINED-IN 8½ SECONDS

New Britains Boost Vital Production 500% On B-29 Superfortress Engine Part

Beryllium Copper Screws, used as tube connections for the fuel injection system of a B-29 engine, help to accomplish the feats of these modern air battlewagons . . . bringing destruction and devastation to our enemies.



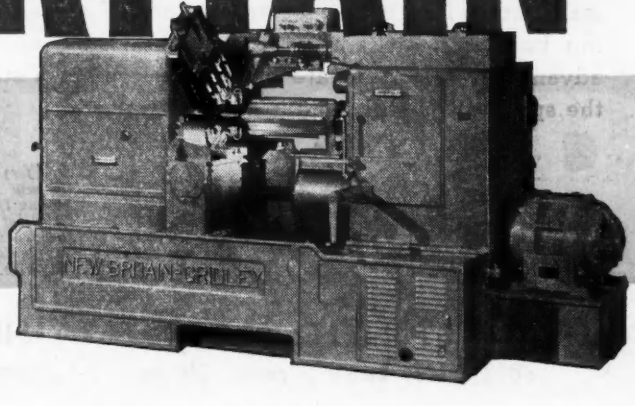


The strategic war metal Beryllium has proved its superiority when combined with copper . . . an alloy possessing the mechanical qualities of strength and hardness of steel plus the conductivity and corrosion resistance of copper. Today's airplanes, tanks, ships, engines, instruments and communications equipment are dependent upon Beryllium Copper parts for superlative performance.

To meet the demands for B-29 bombers, parts manufacturers were called upon to step up production. A small but vital engine screw required forty-two seconds to complete the first operation on an automatic screw machine. New Britain engineering resources were tapped for the answer with the result that a New Britain now completes a finished Beryllium Copper screw blank every eight-and-one-half seconds . . . or 513 pieces gross per hour. The hardness of this alloy is C-18-22 Rockwell and machined at 260 feet per minute with spindle speeds of 1492 R.P.M. Due to the rigidity of New Britain slides, the average life of the carbide tipped tools runs 3500 to 4000 pieces per grind.

This New Britain speed and machining efficiency has not been approached with any other type of automatic and these same practices may readily apply to your present or postwar production. The automatic solution to your metal working problems can be supplied when consulting the New Britain Sales-Engineer in your area . . . or, should you prefer, write direct.

NEW BRITAIN



THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
New Britain-Gridley Machine Division

M-01014

Developments Analyzed at Jet Propulsion Conference

Jet propulsion and gas turbine developments were analyzed on a creative blueprint basis in scientific and technical details at a national three-day conference early this month at Swampscott, Mass., sponsored by the Air Technical Service Command of the Army Air Forces and General Electric Co. Attended by nearly 300 outstanding practical and research engineers of the major aircraft and engine companies in the United States and a delegation from England, the conference was the first one of its scope on jet propulsion ever held.

General Electric engineers who designed and developed the super G-E Jet, which now drives the Army Air Forces Lockheed P-80 fighter, explained and demonstrated many jet propulsion accomplishments and discoveries. These included classified performance facts of the G-E Jets, discussion of gas turbines for potential propeller drive on aircraft, combustion developments, metallurgical advancements, various air compressor designs, and the intricate sequence of test these new-type engines must undergo from factory to flights.

Air Technical Service Command and Navy officers and other engineers contributed specific facts on elements dealing with jet propulsion and gas turbine developments and uses, some of them far-reaching in their military and civilian significance, which cannot now be made public for reasons of military security. Fundamental progress made by aircraft companies in designing and developing planes to be driven by jet engines or gas turbines also was given in detail by leading engineers of several aircraft companies, including Bell, Douglas, Lockheed, Republic, Ryan and Vultee.

Producers Confident

(*Continued from page* 44)

armed services having to step up their purchases unexpectedly is a contingency that has to be reckoned with and makes for an extremely conservative outlook as to future developments. Although conditions are not yet any too bright for the promotion of special alloys with peace-time end uses, the competitive spirit is already beginning to reassert itself. Producers of metals suitable for bright work, such as stainless steel, are laying the groundwork for extensive campaigns, once more normal marketing conditions are restored. A good many innovations are looked for. Clarifying of the patent situation with the annihilation of Germany's influence in the steel domain is only one of the many problems that await straightening out.

Relaxation of controls over certain brass mill products as well as of some uses of zinc, which action was moved ahead by WPB from the date originally set for it, July 1, when metal consumers are to be permitted to go into the open market for all metals not needed in the war effort, is proving more of an encouraging gesture than an immediate influence in the booking of business. Connecticut Valley fabricators are engaged in the task of toning down the demands of some of their unions which, if granted, would imperil the continuance of prices resembling those now in vogue.

Aluminum production continues at a high rate with the record output of more than 100 million pounds registered in March reported as being well maintained.

WPB has revoked all orders restricting the use of beryllium, stocks of the metal now being considered adequate for war use as well as average civilian requirements. Controls governing heretofore the use of domestic silver have been lifted with restrictions on the use of foreign silver remaining in effect.

High Cost of Salvage

Tests made on the cost of scrapping a war weary B-24 bomber, built at an original cost of $250,000, have revealed that the cost of disassembling is about $800 higher than the value of the salvageable material obtained.

WE haven't put it in a book—but the new experience we've acquired in these war production years would probably fill one. This new knowledge added to past know-how will be ready to give you an even better Accurate service on all types of precision springs and wireforms. Carefully controlled manufacture, modern equipment, skilled personnel, broad experience . . . plus engineering that has managed to find better, faster, economical ways of producing both intricate and ordinary jobs . . . These are the advantages that Accurate offers as a source of supply for the springs you will need in the postwar era.

SPRINGS
WIREFORMS
STAMPINGS

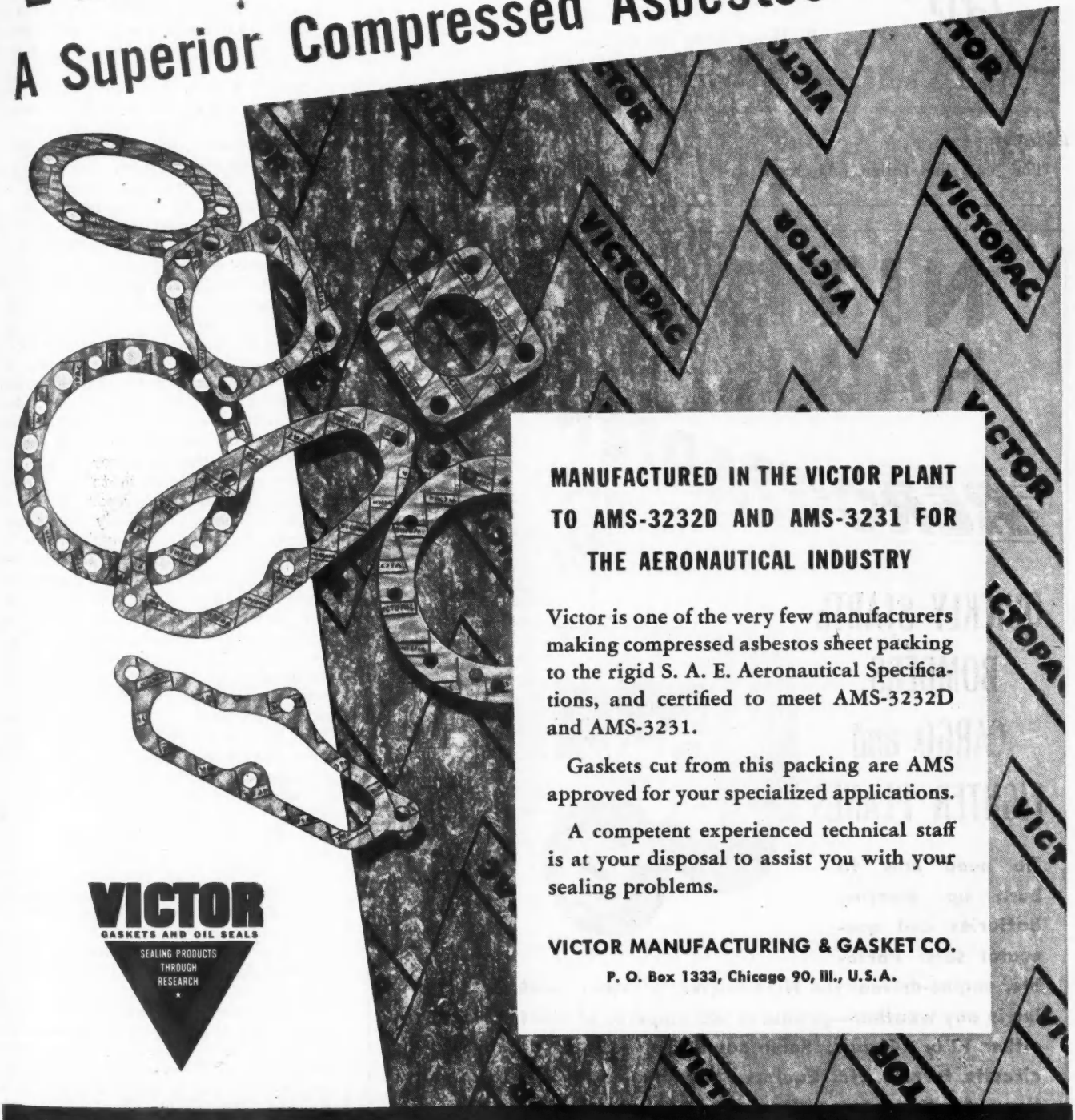
Accurate Springs

Send for your copy of the new Accurate Spring Handbook. It's full of data and formulae which you will find useful. No obligation, of course.

ACCURATE SPRING MANUFACTURING CO.
3811 West Lake Street, Chicago 24, Illinois

VICTOPAC

A Superior Compressed Asbestos Packing



MANUFACTURED IN THE VICTOR PLANT TO AMS-3232D AND AMS-3231 FOR THE AERONAUTICAL INDUSTRY

Victor is one of the very few manufacturers making compressed asbestos sheet packing to the rigid S. A. E. Aeronautical Specifications, and certified to meet AMS-3232D and AMS-3231.

Gaskets cut from this packing are AMS approved for your specialized applications.

A competent experienced technical staff is at your disposal to assist you with your sealing problems.

VICTOR MANUFACTURING & GASKET CO.

P. O. Box 1333, Chicago 90, Ill., U.S.A.

VICTOR
GASKETS AND OIL SEALS
SEALING PRODUCTS THROUGH RESEARCH

VICTOR

Airbriefs

By Henry Lowe Brownback

Business

The blow has fallen. Aircraft production has been sharply curtailed and will be further curtailed shortly. Unemployment is predicted for aircraft and ship producing areas. All of this has been written before in AIRBRIEFS as a certainty but the industry was never actually faced with the actuality. Business, under our system, is founded to create profit for its owners and in order to do this it must give service to the public and value for the money it receives. Incidentally, it creates jobs. Among the more radical element it is claimed that the primary object of business is to create jobs but this is not the fact.

During the war emergency some millions of girls and women, who are not normally factory workers, entered industry to help out and many men normally professional men, farmers and even men who would normally be retired, pitched in. Having gotten a taste of high wartime pay many of these emergency workers are going to try to stay in industry rather than to return to less lucrative employment and will attempt to claim all sorts of generous unemployment benefits in high pay centers rather than to go back to lower pay jobs elsewhere. I am a believer in universal high pay as typified by the aircraft and automotive industries as the creator of the wealth necessary to keep business booming, but it is unfair to the taxpayer and to industry to have charged to them relief payments over the "reconversion" to workers who are actually not a part of industry, but only "pinch-hitters."

When the last of the war is over aviation will no longer be a favored industry which is saving the nation and one in which cost means nothing, but will have to earn its way. In the past, because of the tremendous cost of development the operation of airlines has been subsidized through the Post Office Department. Airplane manufacture has been subsidized through military purchases of development models and, because of the hazards which were always present, pilots received very high pay on civilian airlines. Paying its way will mean that aviation should be organized to operate without subsidies. Such payments are unfair as they charge taxpayers as a whole the cost of services which they do not receive individually and could only have been justified at any time as underwriting the national defense. Aviation has grown up with a trans-Atlantic crossing every 13 minutes and should operate on its own. This will mean the cutting of expenses all along the line and may work some hardship at first, but will be better for the industry in the end. The people who really can do things in and for aviation will reap a reward in line with that gotten in other lines of endeavor and the "lunatic fringe" and incompetents who have always plagued the field will have to look elsewhere for soft berths.

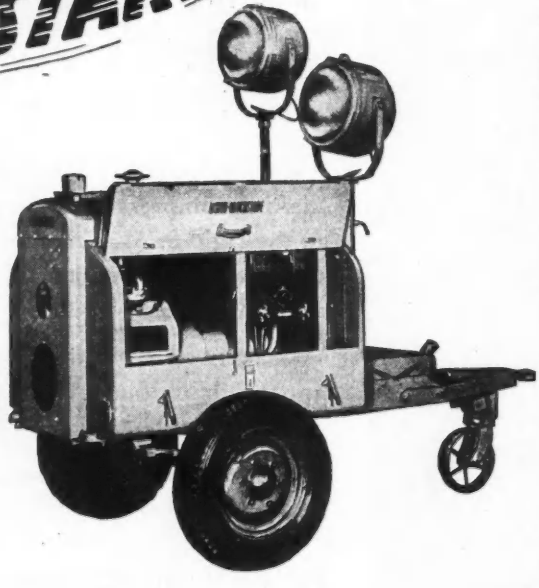
Little Airports

I have been around some of the recently opened and re-opened small air-

(*Turn to page 56, please*)

NITE HAWK

AERO-STARTER



QUICKLY STARTS BOMBERS, CARGO and FIGHTER PLANES

No need now to burn up starting batteries and generator sets. Portable, engine-driven, the NITE-HAWK provides quick, sure starting in any weather—produces 500 amperes of electric power at either 12 or 24 volts. Same power is used to test landing gear, circuits, turrets, etc. Equipped with floodlights for night operations. Air compressor attachment available.

Write for Bulletin NH12A.

NITE HAWK

Lister-Blackstone

INCORPORATED 1706 SO. 68TH ST., MILWAUKEE 14, WIS.

MFRS. OF PORTABLE NITE-HAWK AERO-STARTERS, SEARCHLIGHT AND FLOODLIGHT UNITS

ALSO DIESEL ENGINES AND DIESEL-ELECTRIC POWER PLANTS

Reynolds offers great new alloys...startling new advantages in strength-weight factor

ALMOST OVERNIGHT aluminum has come of age. Today, it's tough, strong, enduring! Actually, new aluminum alloys developed by Reynolds metallurgists, possess unit strengths greater than most structural steels . . . yet section for section, weigh only ⅓ as much. In addition, they are highly resistant to corrosion . . . possess many other qualities of vital interest to manufacturers.

Now the use of aluminum is practicable for entire constructions!

R301 — **Reynolds armor plate alloy—tomorrow's great sheet and plate alloy! Combines a typical tensile strength of 60,000 p.s.i., superior workability, good corrosion-resistance, excellent spot-welding properties. Write for Special Bulletin 50-A. Gives characteristics, properties, other valuable data.**

R303 — **Exceedingly high typical tensile strength. Higher in fact than any aluminum alloy used in the past. Splendid corrosion-resistance. Developed primarily for extrusion and forging stock. Available also in bar, rod, extruded shapes and sheet (bare and clad). Special Bulletin 54-A gives complete information.**

R317 — **Combines free-machining qualities with high strength and excellent heat treatment characteristics. Age-hardens at room temperature after solution heat treatment, thereby eliminates the necessity of costly elevated temperature aging. Good corrosion-resistance. Write for Bulletin 55-A.**

CONSIDER ALUMINUM. Consider the special opportunities—inherent in the new Reynolds aluminum alloys. Consider ease of fabrication . . . thermal and electrical conductivity . . . reflectivity . . . non-magnetic, non-sparking and non-toxic qualities . . . pleasing appearance . . . new low costs. And finally, consider Reynolds nationwide production and service. See catalog in Sweet's . . . or write for Catalog No. 100. Reynolds Metals Company, Aluminum Division, 2513 S. Third Street, Louisville, Ky. *Consider aluminum* . . . **CONSULT REYNOLDS!**

REYNOLDS METALS

REYNOLDS ALUMINUM

ports or "flying fields." They are, I'm sad to say, just like they were from the beginning of flying. There is little sign of serious business outside of the repair shop. On the field we see the usual hot dog stand, the flashy looking girls, trying to look as the French would say "Très Aviation," wearing goggles and helmets and playing up to the three or four "heros" who treat the gaping crowd by doing fool stunts on planes which were never designed to do them. The "instructor" piles one of the said flashy females in an old Army trainer and proceeds to give it the "works" right over the heads of the crowd. An Army pilot standing before the admiring crowd cannot stand this and piles another of the flashy ones into another P.T. and says "I'll show you how the Army does it" and proceeded! Luckily nobody got killed, but any prospective purchaser other than a crazy youngster would have decided to buy something else.

Aviation cannot live on the market which caters to psychology of the wild motorcycle riders and racing outboard drivers. It must have the Plymouth-Buick-Lincoln market. The prospective buyer must be shown how easy it is to fly, how economical of fuel and time flying is and how he can take his wife and family flying in comfort and safety.

France

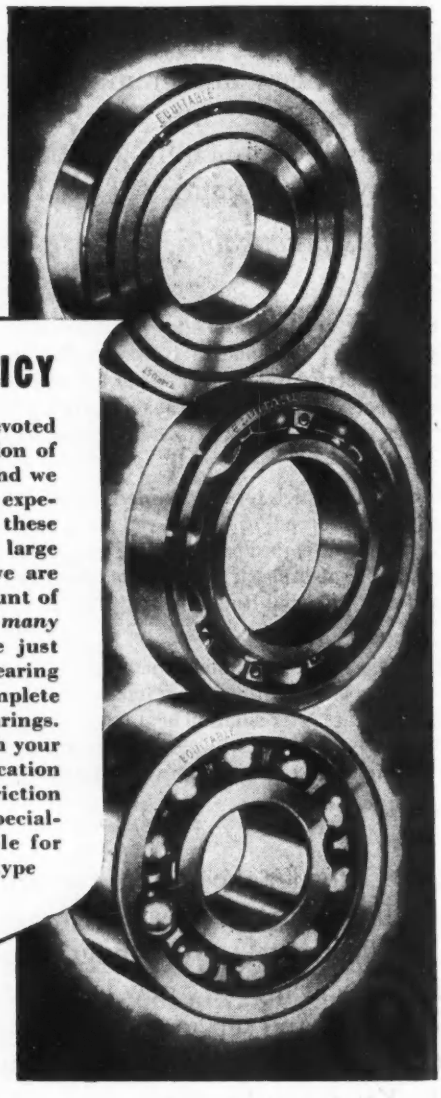
France is going to do everything in her power to establish private flying on a big scale. Plans are for the government to order 20,000 airplanes to be sold cheaply to private flyers and flying clubs. Already 500 have been ordered. The plane will be simple as the specifications call for less than 1000 man hours for its entire production including everything. It is based on the small Caudron and fitted with a 4 cylinder Renault in-line air-cooled engine.

Feeder Lines

One of the most important of aviation's transportation fields will be the feeder line. Back in 1928 when I was designing my C400 engine I conceived the idea of feeder lines operating into the larger airports with mail and expressage. I had a friend in France design an all-wood monoplane with tremendous performance on little power and designed a very simple, rugged five-cylinder engine no more complicated than a good truck engine, and just as husky, to power it. Then I got together with a traffic expert and outlined typical services with rates, schedules, costs, etc. It was ready and much interest shown in it just as the 1929 "crash" came along. The plan went farther than others I have seen as it not only included the operating lines, but the building and repairing of the engines and planes, as well as the training of the pilots and mechanics, at the construction center.

Turbines

The turbines and jet propulsions made or proposed have great interest for me in the fact that they can burn the lower grades of fuel, thus permitting aviation to use more of the crude petroleum than just the cream. They may not be particularly efficient at this stage of development, but neither was the 1912 gasoline engine with which I learned to fly. It may be that even small turbine-reciprocating engine combination units will prove efficient and, in this case, it might be possible to make the reciprocating end of the engine capable of using good motor car fuel and catching up on the efficiency in the turbine element. I have been so busy I have not had a chance to make detailed analyses of such possibilities, but when I get some time I will. At the present time this scheme of using a combination of reciprocating engine and turbine is most promising. It is not a new idea, by the way; I had a friend who backed up a man who actually built a rotary engine exhausting into a turbine during the last war and I made some calculations for it. The project did not succeed commercially as ordinary bronze turbine blades, the only kind available at the time, would not stand the heat.

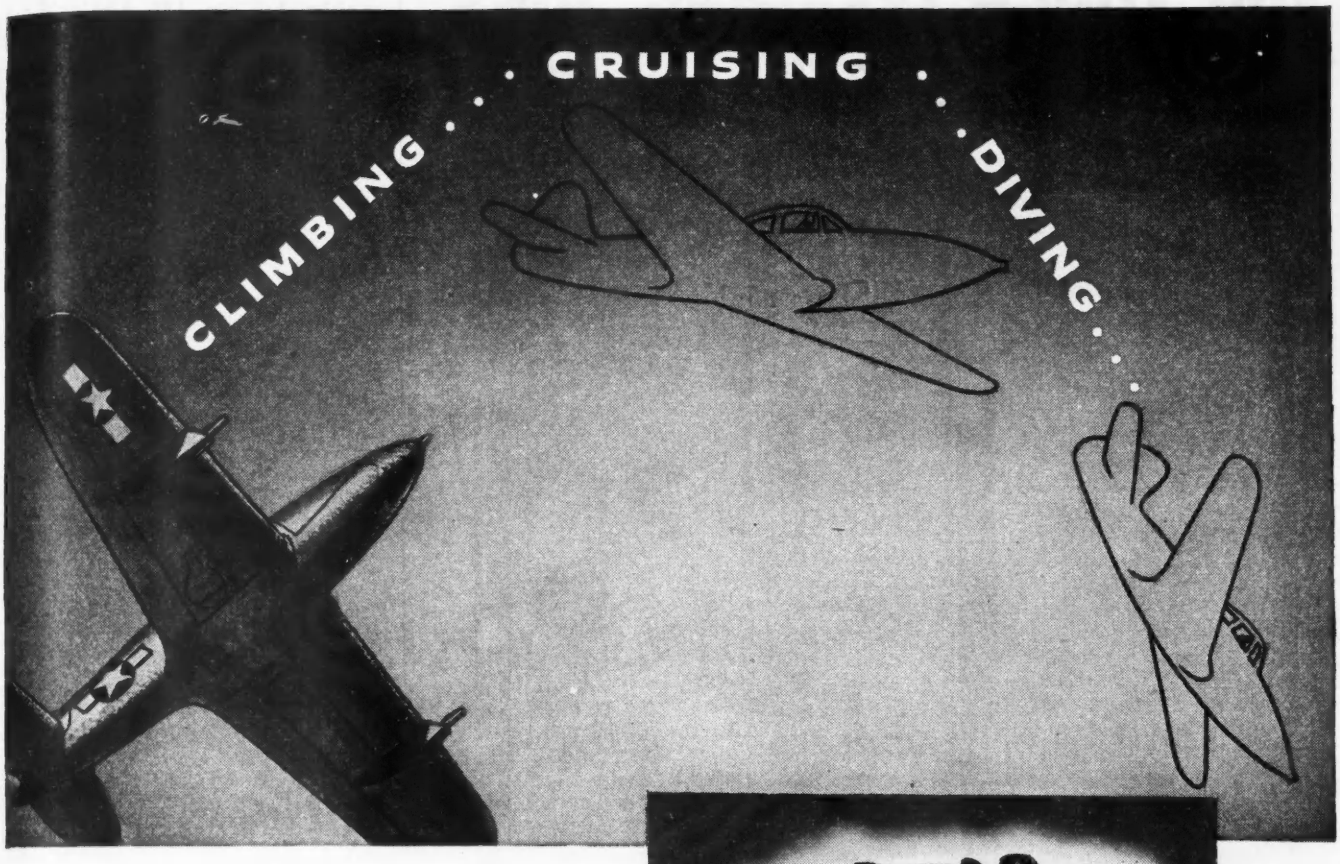


the EQUITABLE POLICY

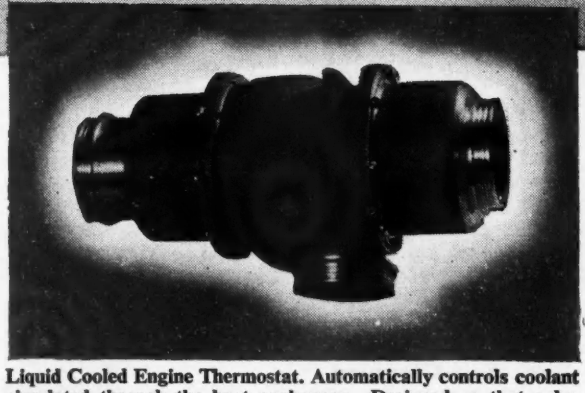
Since the war began we have devoted ourselves largely to the production of bearings to special dimensions and we expect that because of our wide experience in their construction, these bearings will continue to be a large part of our output. However, we are now devoting an increasing amount of our facilities to the production of *many standard bearings* and we have just published our new 28 page bearing catalog showing in detail the complete line of Equitable Standard bearings. We continue to offer to work with your engineers in the design, application and service of any type of anti-friction bearing on which you may ask specialized advice. Look to Equitable for bearing information for *any* type application, standard or special.

Write for our new catalog No. 44

Equitable
BEARING CO. Inc.
DEPT. AI • WALDEN, NEW YORK



. . . CONSTANT TEMPERATURE CONTROL



Liquid Cooled Engine Thermostat. Automatically controls coolant circulated through the heat exchanger. Designed so that valve position unaffected by static pressures in the cooling system, by varying pressure drops across the heat exchanger or control valves, or by changes in altitude.

WHILE he no longer flies it like the old-timers—"by the seat of his pants"—today's plane is probably more than ever a part of the pilot.

He wills himself aloft . . . and his plane soars like a rocket. He dives, he climbs; he cruises as freely as if his heart were an engine and he himself had sprouted wings.

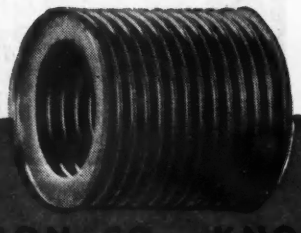
To a large degree, flying facility comes from complete confidence in devices such as Sylphon Aircraft Controls. These rugged, self-powered instruments are responsive to slightest temperature change. Simple in design and construction, utterly dependable, they control the engine coolant, help maintain the constant engine temperatures necessary to efficient performance.

Today, Sylphon Controls work to win the war . . . tomorrow they will be an integral part of machines that go to make a new era of better, more comfortable living.

Write for Bulletin LB-822, describing latest developments in Sylphon Aircraft Controls.

New Movie—"The Story of Metal Bellows" is available to interested executives and organizations. Graphic. Highly informative.

FULTON SYLPHON

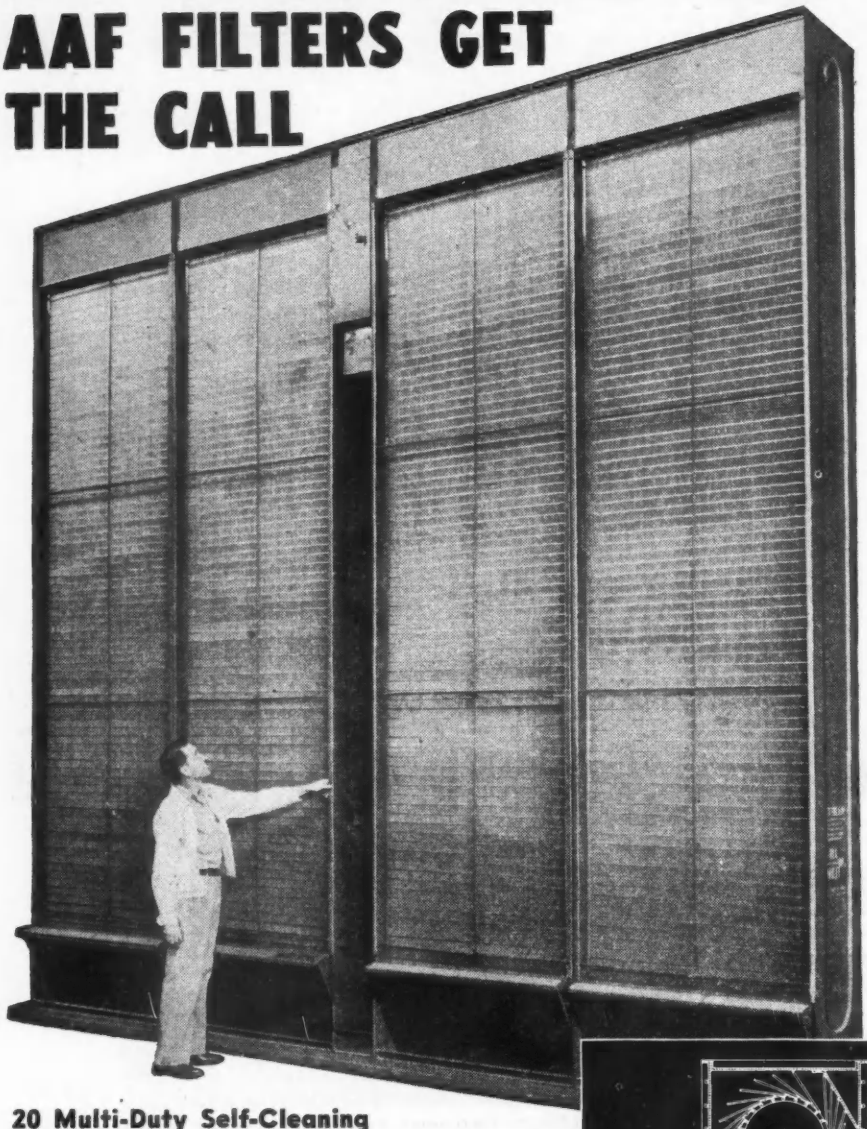


TEMPERATURE CONTROLS . . . BELLOWS . . . BELLOWS ASSEMBLIES

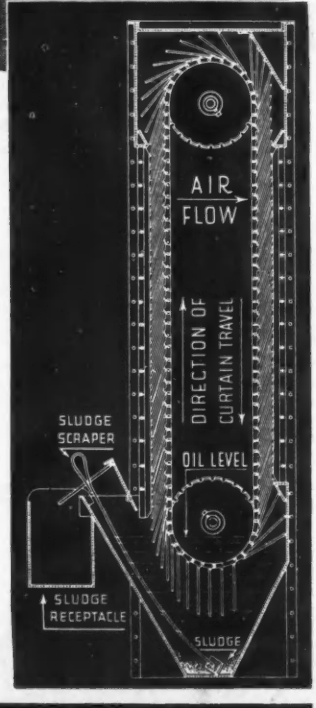
THE FULTON SYLPHON CO., KNOXVILLE 4, TENNESSEE

Canadian Representatives, Darling Brothers, Montreal

FOR TOUGH CLEANING JOBS, AAF FILTERS GET THE CALL



20 Multi-Duty Self-Cleaning Filters like this one clean the air for the new G-E jet-propulsion engine plant, filtering the astounding total of 1,732,800 cfm of air. High efficiency is obtained with Multi-Duty Filters in removing soot and dust particles. Thus, they protect air conditioning equipment, plant machinery, precision production and provide more healthful working conditions. Choice of three types of filter panels, depending on dust condition and operating requirements. Continued improvement in the Multi-Duty Filter illustrates the AAF policy of "good enough is not enough if better is required." Ask for Multi-Duty Bulletin No. 241-A.



The filter panels in the curtain overlap like shingles when in the air stream, but are separated and individually cleaned and re-oiled as they pass through the oil bath.

AAF

AMERICAN AIR FILTER COMPANY INC.
INCORPORATED
449 Central Avenue, Louisville 8, Ky.—In Canada: Darling Bros., Ltd., Montreal, P. Q.

Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE AND AVIATION INDUSTRIES

Fairly stable levels of business activity have continued. The *New York Times* index for the week ended May 19 rose to 144.3, as against 141.4 in the preceding week and 144.8 a year ago.

Department store sales as reported by the Federal Reserve Board for the week ended May 26 resumed a rising trend, the index for the period standing at 182 per cent of the 1935-39 average, as compared with 178 in the week before and 168 a year ago. Comparisons with last year's corresponding figures, moreover, show gains of 3 per cent for the four weeks ended on that date and 12 per cent for 1945 thus far.

Electric power production declined more than seasonally in the week ended May 26 and was 0.9 per cent above the comparable level last year, as against a similar rise of 3.1 per cent recorded a week earlier.

Railway freight loadings during the same period totaled 882,437 cars, 1.6 per cent more than for the week before and equally above the corresponding number a year ago.

Crude oil production during the week ended May 26 averaged 4,866,765 barrels daily, 700 barrels below the figure for the preceding week but 352,715 barrels more than the output a year ago and 265 barrels above the average recommended by the Petroleum Administration for War as the goal in May.

Production of soft coal in the week ended May 19 is estimated at 11,360,000 net tons, as against 10,645,000 a week earlier and 12,012 000 tons a year ago. The output thus far in 1945 is 8.2 per cent below the corresponding quantity last year.

Engineering construction contracts awarded during the week ended May 31, according to *Engineering News-Record*, totaled $21,404,000, the drop of 39 per cent below the figure for the preceding week reflecting the influence of a holiday. This sum is 7 per cent less than the comparable amount last year. For 1945 to date, the contract total is 9 per cent below the corresponding figure in 1944.

The Journal of Commerce weekly index of wholesale commodity prices as of May 26 was unchanged at 110.5 per cent of the 1927-29 average, as against 108.2 a year ago.

Member bank reserves increased $254,000,000 during the week ended May 30, reflecting a rise of $278,000,000 in total Reserve Bank credit, a decline of $100,000,000 in Treasury deposits with the Reserve banks and other changes. Excess reserves rose to an estimated total of $1,100,000,000. During the preceding week, earning assets of reporting member banks rose $254,000,000, including an increase of $7,000,000 in commercial, industrial and agricultural loans.

McDougal Wins Lamme Medal

Taine G. McDougal, head of the spark plug division of AC Spark Plug Division of General Motors, was awarded Ohio University's 1945 Lamme Medal at the commencement on June 8.

The medal is presented annually to an Ohio State alumnus chosen "for meritorious achievement in engineering or the technical arts."

Hycar sheet saves $18,950 yearly in aircraft stretch press routine

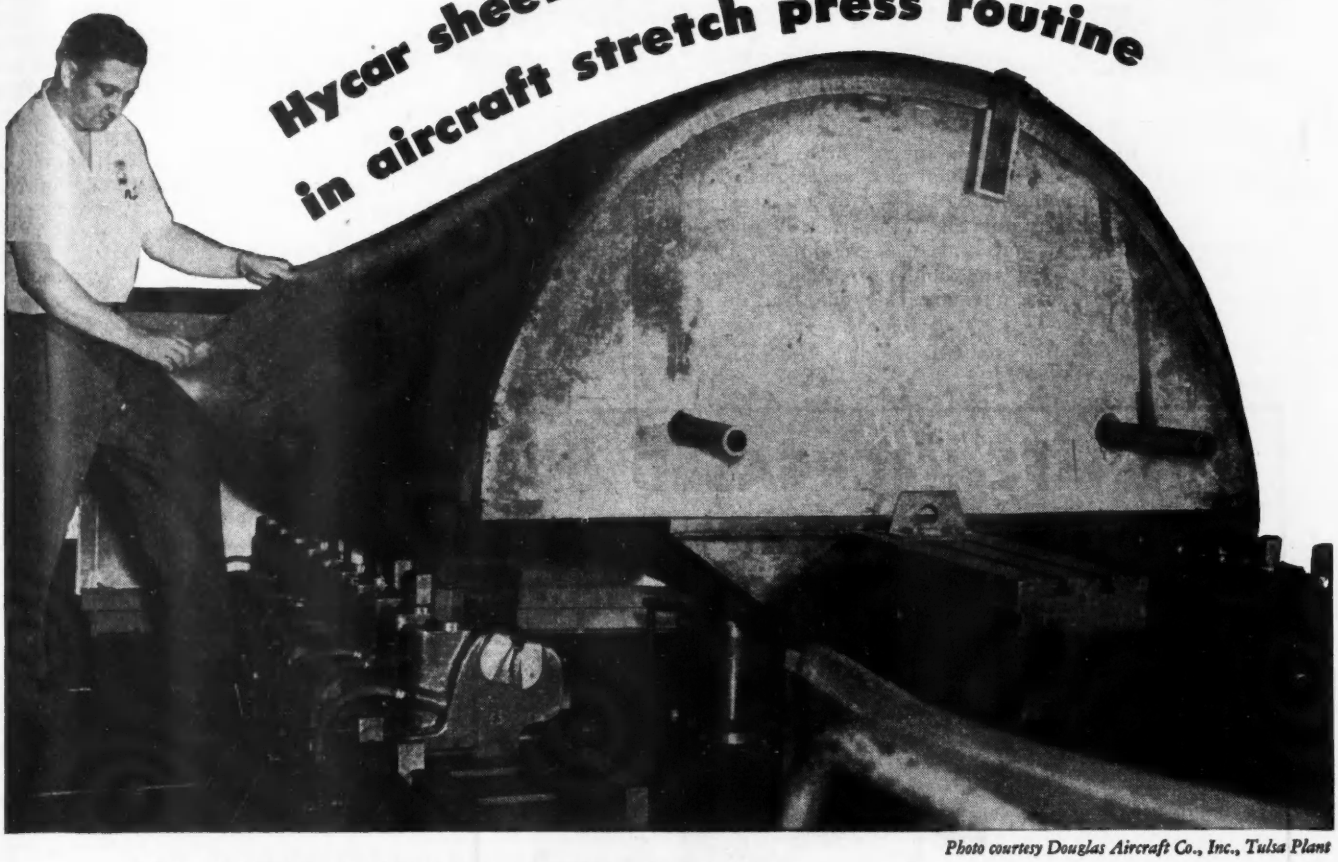


Photo courtesy Douglas Aircraft Co., Inc., Tulsa Plant

42 OPERATIONS CUT TO 18!

CRITICALLY needed manpower —lots of it—was required to perform the 42 operations necessary in stretching each sheet of aluminum on presses like the one in the picture. Before each stretch the die, shaped like a huge half barrel, had to be covered with grease so the metal would not stick. Then the formed metal had to be de-greased by a series of laborious, time-consuming processes.

Then someone thought of using a rubber sheet between die and metal. Because it would still be necessary to grease the die to permit the rubber to stretch with the metal, a highly oil-resistant material was called for. Hycar synthetic rubber provided the answer here just as it has done in so many difficult industrial applications. Unaffected by the grease, Hycar sheets keep the metal clean and eliminate the need for de-greasing; forty-two operations cut to 18; thousands of vital man hours made available for other work; $18,950 saved each year. And, because of their oil resistance, toughness and other inherent properties, the Hycar sheets last indefinitely.

Additional important properties of Hycar synthetic rubbers are shown in the box at the right. Check the requirements of your rubber parts —molded, extruded, or calendered— against the list, keeping in mind that it is possible to select the desired *combination* of properties to meet established service conditions. You'll find, as have so many engineers and designers, that Hycar is the material to use for long-time dependable performance. Ask your supplier for parts made from Hycar. *Hycar Chemical Company, Akron 8, Ohio.*

CHECK THESE SUPERIOR FEATURES OF HYCAR

1. *EXTREME OIL RESISTANCE—insuring dimensional stability of parts.*
2. *HIGH TEMPERATURE RESISTANCE—up to 250° F. dry heat; up to 300° F. hot oil.*
3. *ABRASION RESISTANCE—50% greater than natural rubber.*
4. *MINIMUM COLD FLOW—even at elevated temperatures.*
5. *LOW TEMPERATURE FLEXIBILITY—down to —65° F.*
6. *LIGHT WEIGHT—15% to 25% lighter than many other synthetic rubbers.*
7. *AGE RESISTANCE—exceptionally resistant to checking or cracking from oxidation.*
8. *HARDNESS RANGE—compounds can be varied from extremely soft to bone hard.*
9. *NON-ADHERENT TO METAL—compounds will not adhere to metals even after prolonged contact under pressure. (Metal adhesions can be readily obtained when desired.)*

Hycar

Reg. U. S. Pat. Off.

LARGEST PRIVATE PRODUCER OF BUTADIENE TYPE

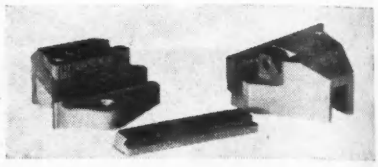
Synthetic Rubbers

New Production Equipment

LANDIS MACHINE COMPANY, Waynesboro, Pa., has developed a new chaser and chaser holder combination which simplifies interchanging of chasers and also imparts greater rigidity and strength to the combination.

The new Lanrac chaser and holder employs a rack tooth arrangement to quickly locate the chaser in its approximate position. The chaser has rack teeth milled for its full length on the offset seating surface, and likewise rack teeth are milled on the chaser clamp at the end nearest the chaser cutting edge. When interchanging chasers, the chaser is placed on the holder in its approximate position and clamped lightly. An adjusting screw which engages the back end of the chaser clamp is then employed to advance the chaser and chaser clamp as a unit to the exact position. Elongated slots in the chaser clamp permit sufficient lateral movement of the clamp slightly greater than the pitch of the rack.

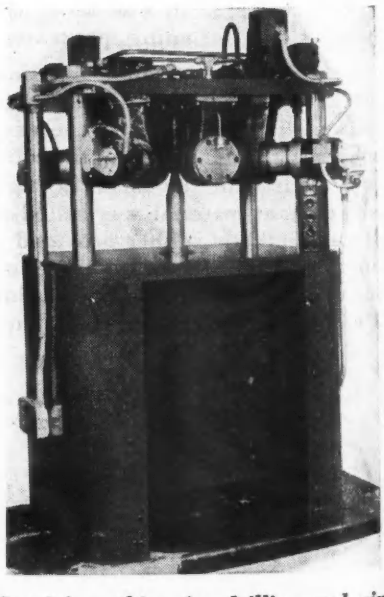
Lanrac chasers can be used with old type chaser holders, without the use of the Lanrac type clamp. All new Landis die heads employing standard chasers 15/16 in. and wider will eventually be equipped with this new chaser holder and chaser combination.



Lanrac chaser and holders

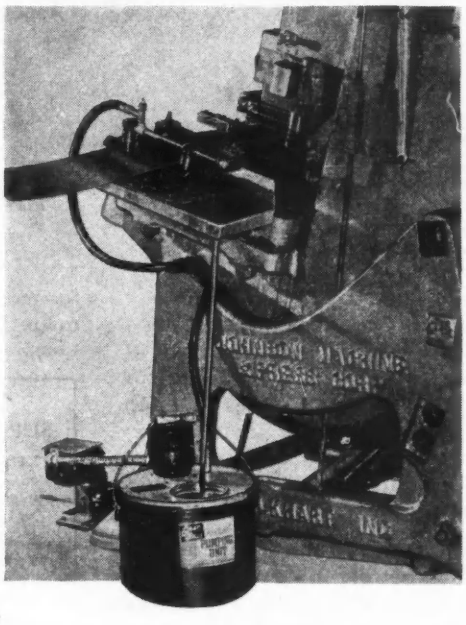
A SPECIFIC purpose machine for drilling and pin inserting was recently completed by Hydraulic Machinery, Inc., Dearborn, Mich. The machine drills four holes through the assembly of the nose and body of the 60-mm shell and then presses four .090-in. brass pins into the drilled holes. All of the movements of the machine are controlled by air and electricity. An air cylinder positions the shell for drilling. The four holes are drilled simultaneously with four self-contained electric drill heads mounted at a 45 deg angle from each other. Upon completion of the drilling the heads return to the start position. Through a switch, hooked up in series on each head, contact is made to a solenoid operating

(*Turn to page 64, please*)



Special machine for drilling and pin inserting

DIE LIFE INCREASED ON BLANKING OPERATION WITH *GRAY-MILLS* Di-Lube Unit



Gray-Mills Di-Lube Units apply lubricants to die, punch or work—constantly or intermittently. There is a size for every need.

BY replacing cumbersome methods of lubricating strip stock for punch press operations, with automatic die lubrication by a Gray-Mills Di-Lube Pumping Unit, a Chicago manufacturer increased the life of their carbide dies, as well as achieved greater efficiency of operation. The stock passes through a slotted tube into which a paraffin base oil is pumped by the Di-Lube Units. The petcock controls the flow of oil into the tube and thereby the amount applied to the stock as it passes through the slot. Excess oil drips into a pan beneath the operation and is returned to the tank for reuse. The Di-Lube Units offer an inexpensive, automatic method of proper die lubrication and save time and labor as well as increasing die life. Write for details.

GRAY-MILLS **DI-LUBE UNITS**

GRAY-MILLS CO.

1929 Ridge Avenue ★ Evanston, Illinois

The New Stinson Voyager 125

Here's the Stinson Voyager 125, the personal plane that we will be making as soon as war conditions permit.

It is a plane that combines the *safety* and *reliability* of the prewar Stinson Voyager with the *toughness* and *utility* of the "Flying Jeep."

Powered by a 125-h.p. engine, the Voyager 125 carries pilot and three passengers. It has a cruising range of 580 miles, a rate of climb of 670 feet per minute at sea level, and a service ceiling of 14,000 feet.

The Voyager 125 has a maximum speed of 128 m.p.h. and cruises at 116 m.p.h. It takes off, with flaps down, after a run of 550 feet, lands with a roll of 280 feet.

We invite inquiries about the new Stinson Voyager 125, and our plans for the production of personal planes.

For full information and free, illustrated brochure, write to Private Sales Director, Stinson Division, Consolidated Vultee Aircraft Corporation, Wayne, Mich.

PARTS FOR STINSON PERSONAL PLANES
Stinson service is available to help the thousands of Stinson owners to keep their planes in the air. We are now making a full line of parts. Order those you need through your local Stinson distributor or direct from the factory.

Stinson

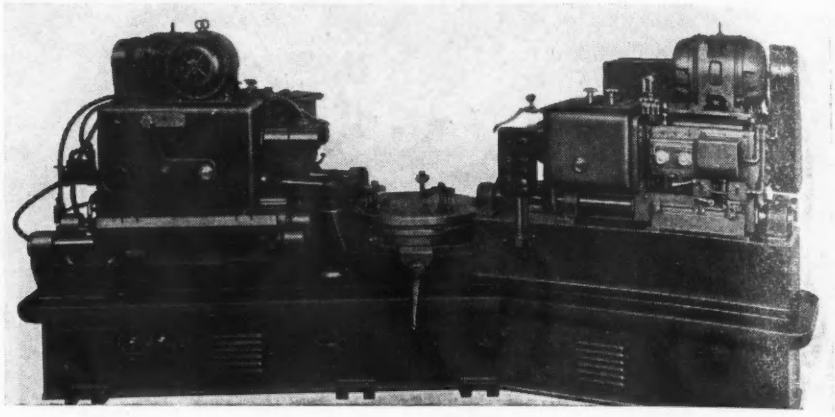
The Aircraft Standard of the World

DIVISION—CONSOLIDATED VULTEE AIRCRAFT CORPORATION
WAYNE, MICHIGAN

valve which indexes the shell 45 deg. Upon completion of the indexing, the pressure switch completes the circuit, allowing the air cylinder to move forward, which in turn presses the pins into the drilled holes.

A SPECIAL-PURPOSE, three-way machine for boring, facing and tapping heavy-duty valves for use in the oil fields has been designed and built by Snyder Tool & Engineering Company, Detroit, Mich.

Boring and facing is done with a four-speed, single spindle head which is driven and advanced into the work by a Snyder self-contained hydraulic guide bar unit.



Snyder special-purpose, three-way machine

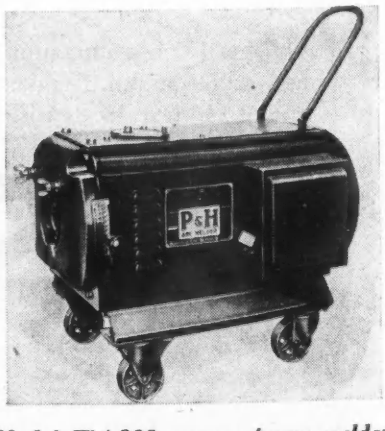
To the left of the operator and in front of one of the two boring units is installed a lead screw tapping device which has also a variable tool spindle speed. The entire tapping unit is mounted on a guide bar slide for hydraulic rapid advance. Spindles are equipped with a breech lock and special tapered holes to make the exchange of tools quick and easy.

The index table is mounted on a manually operated elevating mechanism which compensates for the various sizes of work and also brings the tools concentric with the boss on the work-piece. This table is indexed for 180 deg with an intermediate index for the tapping operation.

RESPONDING to demands for larger capacity in a square frame welder, the Harnischfeger Corp., Milwaukee, Wis., is introducing the Model WA-300, which provides welding service range rating of from 60 to 375 amp. Retaining the design of the smaller square frame welders, the large model also retains the two-part construction, single heat control, visual current calibration, and adaptability to parallel operation where higher amperage is desired.

Appearing for the first time in the Model WA-300 are such new features as weather-proof construction, polarity

(*Turn to page 67, please*)



Model WA-300 square frame welder

BLAKESLEE DEGREASERS
SPEED UP
METAL CLEANING!

Save TIME
Save LABOR
Save SPACE
Save MONEY

A Fast, Economical, Safe Process

Blakeslee "Solvent Vapor" degreasing cleans and dries metal in one operation—ready for plating, painting, enamelling, heat-treating, etc. All types of metal parts from stampings to threaded pieces are handled with speed, economy and safety. *There are no fire hazards, no extra drying required and no more rejects.*

Why not talk over your degreasing problems with one of our men? Whatever your needs may be—or the difficulties of application—there is a size and type of Blakeslee equipment that will do the job for you. Write today for a *free* copy of our new booklet, "Solvent Degreasing".

BLAKESLEE
Solvent Vapor DEGREASERS
Metal Parts Washers

Standard Units and Specials ENGINEERED for YOU

G. S. BLAKESLEE & COMPANY
Main Office and Plant: Cicero Station, Chicago 50, Ill.
New York Toronto, Ont.

reversing switch and removable stator, plus overload protection both for contacts and for the new low-voltage magnetic starter.

FEDERAL PRODUCTS CORP., Providence, R. I., is exclusive sales agent for a new air gaging system manufactured by Metrical Laboratories, Inc., Ann Arbor, Mich., known as Federal Metricator system of dimensional gaging by air.

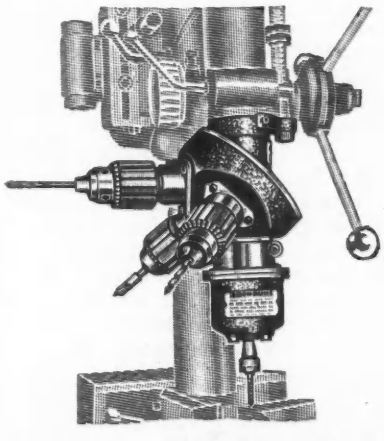
This system consists of a graduated column and a gaging head. A manometer tube, built into the water column, indicates variations in the air pressure.

The standard gaging head is constructed with two measuring orifices which are recessed with respect to the outer skirt of the gaging member. This recessed construction of the orifices of the gaging head permits a part whose

(*Turn to page* 68, *please*)

Federal metricator system air gage

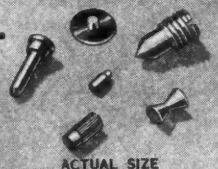
Quad-Tapper Tapping Attachment



This is the tapping unit to attach to the Quadrill turret attachment for drill presses made by Chicago Drillet Corp., Chicago, Ill. In the description of this new unit, known as the Quad Tapper, which appeared on page 58 of the May 15 issue of* Automotive and Aviation Industries, *the illustration was inadvertently shown in the wrong position.

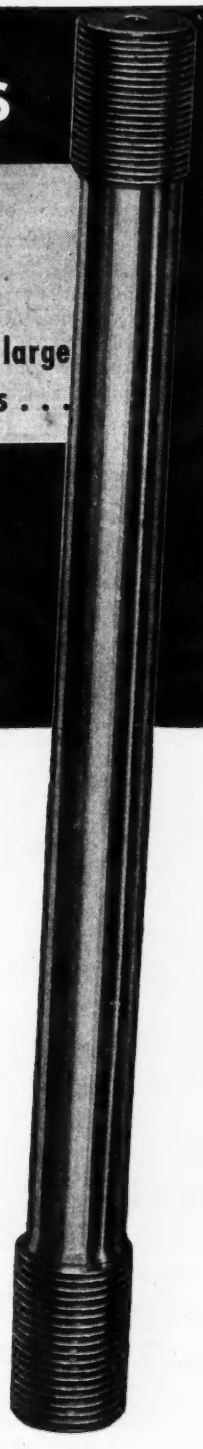
Ultra-precision parts

from very small like these . . .



ACTUAL SIZE

to very large like this . . .



from One Source saves you time and headaches

WESTERN offers unusual skill and ingenuity — and facilities for producing complete a wide range of shapes and sizes, on a quantity production basis

Hundreds of buyers of precision screw machine parts are saving themselves time and trouble by use of Western's skill, experience and equipment for doing the work *completely* and flawlessly to specifications. Simple or complex pieces or assemblies, from fine wire size to 4 5/8″ round — all secondary or finishing operations, including precision grinding, heat-treating, pentrating. . . . As samples of the wide range, take the parts illustrated. The small parts are made fast and accurately in one operation — and the smallest is only .060″ in diameter, .150″ long. The large Diesel engine stud is over 17″ long, turned and ground from heat-treated alloy steel, not a tool mark on it, 1 3/8″ National Fine ground threads exceeding Class 4 fit. . . . Save yourself headaches, delays, high costs by getting Western quotations and recommendations — act now on components for post-war products.

This stud is over 17″ long, a precision job with a jewel-like finish.

Aircraft Products Division

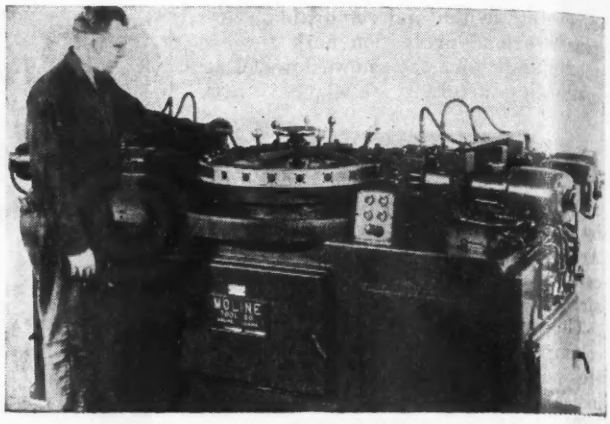
Western Automatic Machine Screw Company

724 Lake Ave., Elyria, O

Precision Parts and Assemblies Since 1873

surface is easily marred to be gaged without the surface of the part actually touching the gaging member. This recessed design of the gaging head contributes to the maintenance of operating accuracy, due to the fact that the protective outer skirt of the gaging member can wear considerably before the two measuring orifices themselves show signs of wear.

ONE of several designs of completely automatic machines produced by Moline Tool Company, Moline, Ill., for work on aircraft gun turret rings, the M32 has many features which are applicable to machining problems presented by other kinds of metal parts.



Moline Tool Co. PA-902, M32 special horizontal hydraulic feed machine

The part to be machined in this case is an aluminum ring and the M32 automatically drills and reams 24 groups of four small holes. At the same time it finish bores and chamfers a larger hole located at the center of each group which was drilled during a previous machining operation.

There are two 4-spindle drilling units, two 4-spindle reaming units and two single-spindle precision boring units on the machine. Each unit has its own hydraulic feed cylinder and feed rate regulating valve.

Complete automatic electric control renders skill on the part of the operator unnecessary since all he has to do is load and unload the work from the fixture and press the button to start the automatic operating cycle. During the cycle the work is indexed automatically by hydraulic power to bring each group of holes into proper relationship with the tools as required.

THE Cross 4-spindle special machine, made by the Cross Co., Detroit, Mich., simultaneously grinds and hones two hardened taper bearings, cast integral in automotive wheel hubs. The new process, eliminating pressing in separate bearing cups, is said to produce a more nearly concentric bearing at lower unit cost.

The machine consists essentially of a base, mounting a 3-station, trunnion type, indexing work-fixture between two opposed grinding heads operating at the first station; two opposed honing heads at the second station and a third station for loading and unloading the work-pieces. All elements of the machine are hydraulically actuated and automatically controlled by electric push buttons.

Advertising Note

The opening of an Atlanta office to serve Ford Branches and dealers in the company's southeast region has been announced by J. Walter Thompson Company, advertising agency.

T. Russell Paulson has been appointed manager of the new office with Chester R. Curtis as assistant manager.

"Engineering" dominates the manufacture of Grizzly Brake Lining — it develops formulas . . . controls quality throughout production . . . maintains modern efficient methods . . . and is geared to cooperate fully with the equipment manufacturers' engineering departments to assure maximum performance from all brake systems in which Grizzly Brake Linings are installed.

Let the camera take you through the most modern plant in the brake lining industry—write for your photographic report "Building Up to a Name".

Grizzly Manufacturing Company, Paulding, Ohio.

GRIZZLY
REG. U. S. PAT. OFF.
BRAKE LINING

Michigan
WELDED STEEL TUBING

The Modern Electric Resistance Welded Steel Tube

ROUND ★ SQUARE ★ RECTANGULAR and SPECIAL SHAPES

SIZES: ¼" to 4" O. D. GAUGES: 9 to 22

The manufacturing method employed in the production of Michigan welded steel tube results in a uniformly smooth, scale-free surface.

Offered in commercial mill lengths or cut to specified lengths, shaped and fabricated ready for assembly.

Engineering advice and technical help in the selection of tubing best suited to meet your needs.

Michigan STEEL TUBE PRODUCTS COMPANY

More Than 25 Years in the Business

9450 BUFFALO ST. • DETROIT 12, MICH.

Factories: Detroit, Michigan and Shelby, Ohio

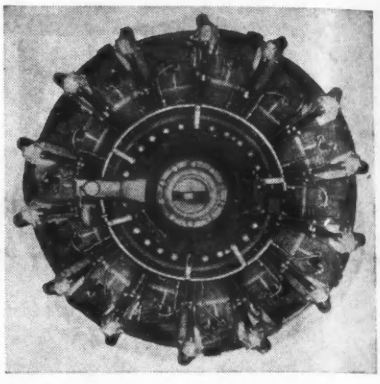
DISTRIBUTORS: Steel Sales Corp., Detroit, Chicago, St. Louis, Milwaukee and Minneapolis—Miller Steel Co., Inc., Hillside, N. J.—C. L. Hyland, Dayton, Ohio—Dirks & Company, Portland, Oregon—James J. Shannon, Milton, Mass.—Service Steel Co., Los Angeles, Calif.—American Tubular & Steel Products Co., Pittsburgh, Pa.—Strong, Carlisle & Hammond Co., Cleveland, Ohio—C. A. Russell, Inc., Houston, Tex.—Drummond, McCall & Co., Ltd., Toronto, Canada.

New Products for Aircraft

Detonation Indicator for Aircraft Engines

The Sperry-M.I.T. detonation indicator is a new development of the Sperry Gyroscope Co. As a checking device for pre-flight (or in flight) motor functioning, the indicator picks up defects not usually available without disassembly of the engine. Thus engine malfunctions may be discovered and corrective adjustments made in time to prevent serious injury to pistons and cylinders, it is pointed out. Furthermore, the quality of aircraft fuel becomes apparent under both test-stand and flight conditions through the functioning of the indicator.

In the Sperry-M.I.T. detonation indicator, a pick-up unit is attached to the cylinder wall and connected through an amplifier to an indicator on the instrument board which flashes a warning when detonation conditions occur. No piercing of the cylinder is necessary



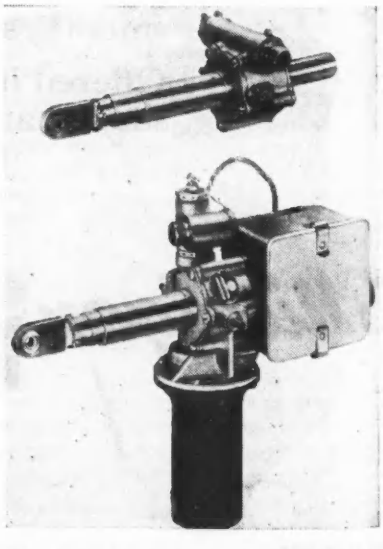
Sperry pick-up unit in place on aircraft engine

to make installation and the equipment will meet all types of power plant installation both in aircraft and test-stand operations. It permits immediate discovery of the cylinder at fault through the operation of a selector switch.

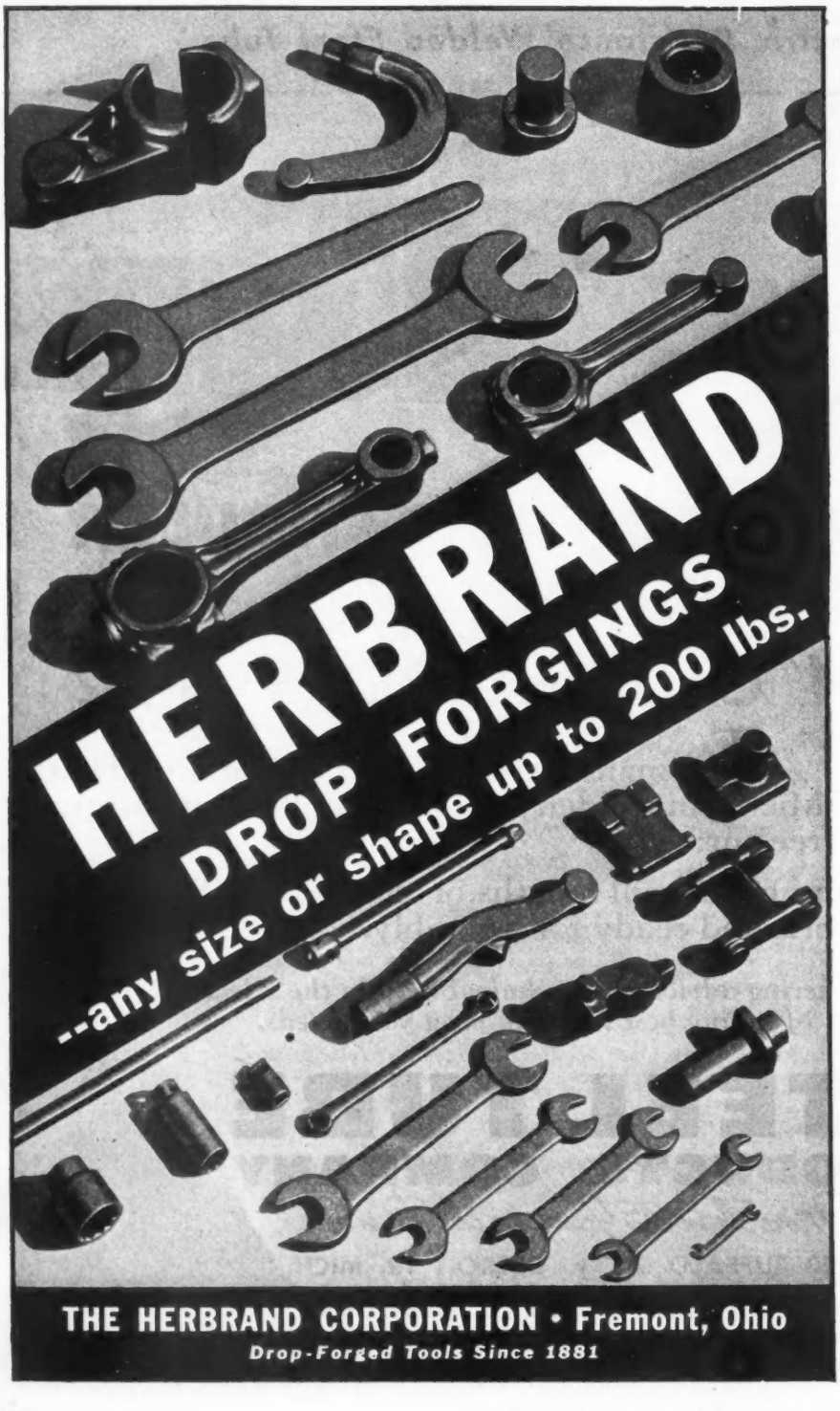
Linear Actuators Provide Dual Operation

Dual operation is possible with two linear actuators manufactured by Foote Bros. Gear and Machine Corporation, Chicago, Ill. The primary actuator is powered by a 1/6 hp electric motor. The secondary actuator (motorless type) gains its power from the primary by means of a flexible

(*Turn to page 74, please*)



Linear actuators made by Foote Bros. Gear and Machine Corp.


HERBRAND
DROP FORGINGS
--any size or shape up to 200 lbs.
THE HERBRAND CORPORATION • Fremont, Ohio
Drop-Forged Tools Since 1881

# of MACHINABILITY

Look at the little camshaft on the opposite page. It was made from UNION SUPERCUT (A.I.S.I. B-1113)—fabricated on automatic and hand screw machines, then hardened at wearing surfaces by selective carburizing.

But the important part of the story is the amount of machining necessary. The weight of the finished camshaft—only ⅛ of the steel bar from which it was made—indicates that it was necessary to machine away ⅞ of the original bar to produce this complicated little part.

That's why UNION SUPERCUT was used—because it is "tops" among free-machining steels.

Long ago, Union Drawn recognized the vital importance of *MACHINABILITY* in the production of steel parts. Metallurgists directed the major share of their laboratory and plant research toward better machinability. Engineers cut up tons of steel on an "automatic" and spent days and weeks in customers' plants studying the performance of various steels.

The results: A steadily increasing ability on the part of Republic Union Cold Drawn Steels to machine to a fine, smooth surface at higher speeds and heavier feeds.

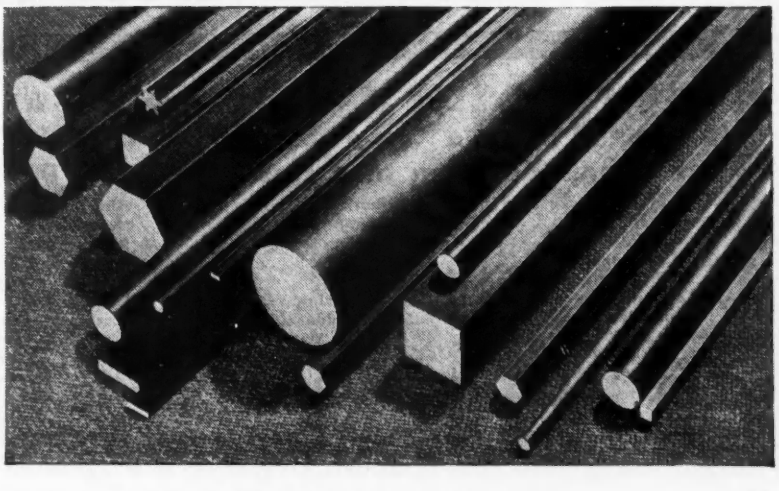
A marked decrease in abrasive elements in the steel—providing longer tool life, more parts per dollar of tool investment, fewer grindings of tools, greater efficiency of operation, more output.

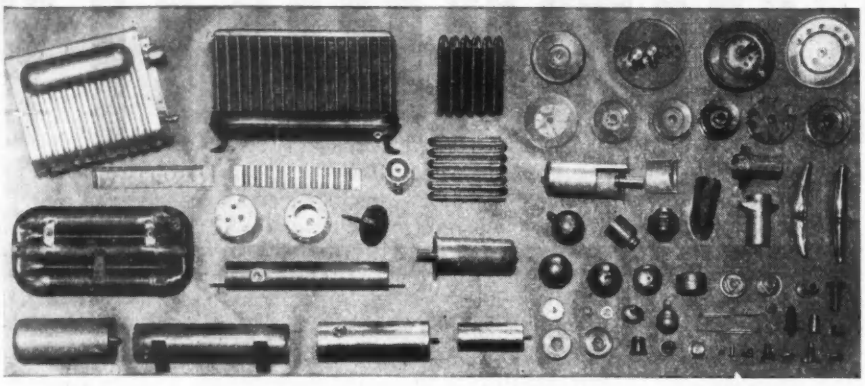
And all these advantages without sacrifice of physical and heat-treating properties.

This little camshaft is only one of thousands of different parts which have demonstrated the cost-saving, production-increasing machinability of Republic Union Cold Drawn Steels. The steel parts YOU make probably will do the same if you specify these steels. Republic metallurgists are ready to work with you to obtain maximum results in machining and heat treating.

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division • Massillon, Ohio
GENERAL OFFICES • • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

To further increase machinability, and to assure uniform hardness and physical properties, Union Drawn has greatly increased capacity in all plants for *furnace treated* cold drawn steels—annealed, normalized, spheroidized, stress relieved and otherwise heat treated.





Some parts being joined in EF brazing and soldering furnaces. Products ranging from small metal radio tubes up to large automotive and refrigerator units are joined neatly, securely and economically by this process.

Aluminum, Brass, Steel and Other Assemblies

Are Securely and Economically Joined

In EF Soldering and Brazing Furnaces

Products difficult or expensive to make in one piece can be made in several pieces and joined. Products requiring several stampings joined or requiring screw machine parts, forgings and stampings to complete the unit, can be neatly, and economically joined right in your production line. Strong, leak-proof joints are made and the completed units are discharged from the furnace —clean and bright. Any number of joints in the same product or any number of pieces can be joined at one time.

Result of a laboratory test on an automobile fan pulley in which the hub was brazed to the web. The complete pulley was placed in a press and pressure applied. The steel web broke but the brazed joint held securely.

Investigate EF Furnaces for Joining Your Metal Parts

Send for printed matter showing various types of EF brazing furnaces

The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces---For Any Process, Product or Production

FURNACES OIL, GAS or ELECTRIC

For Every Heating and Heat Treating Process

Aluminum Brazing	Carburizing	Nitriding
Annealing	Drawing	Normalizing
Billet Heating	Enameling	Soaking Pits
Bright Annealing	Forging	Scale-Free Hardening
Bright Hardening	Hardening	Quenching Machines
Copper Brazing	Malleablizing	Ceramic Kilns, etc.
Controlled Atmosphere	Silver Soldering	Process Heating

We Build the Furnace to Fit Your Job

THE ELECTRIC FURNACE CO.

SALEM, OHIO

shaft coupling which synchronizes the two units.

Both actuators have a linear action of five in. at an extension speed of twelve sec. and a retraction speed of nine sec. Travel of the screwjack is accurately controlled by limit switches and stops may be adjusted by a single screw. These two models are capable of handling working loads up to 750 lb. with a static load capacity or 2500 lb.

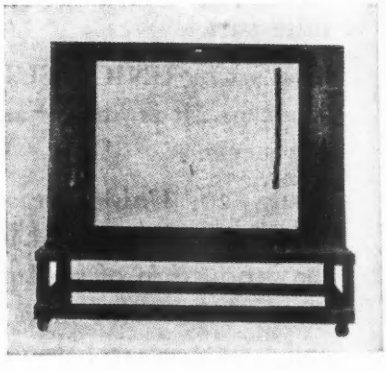
The 1/6-hp motor of the primary unit operates at 8000 rpm from 26 volts dc at 11½ amp and is equipped with a magnetic brake for instantaneous stops and to prevent the gear train from creeping due to vibration of the plane.

These two units are used on the P-38 Lockheed Lightning plane and operate with a flexible shaft approximately three ft. long to open and close the oil cooler flaps.

Multiple Manometer

Trimount Instrument Company, Chicago, Ill., has been licensed by Consolidated Vultee Aircraft Corp. to build the Consolidated designed 50-tube inclined tube manometer for wind tunnel research.

Divisions on scale are horizontal, from 1 to 10 in., calibrated in tenths,



Manometer built by Trimount Instrument Co.

which makes possible very high accuracies. Wells are aluminum or stainless steel. The unusual tube and well arrangement is leakproof. The instrument is relatively light and compact, and is portable.

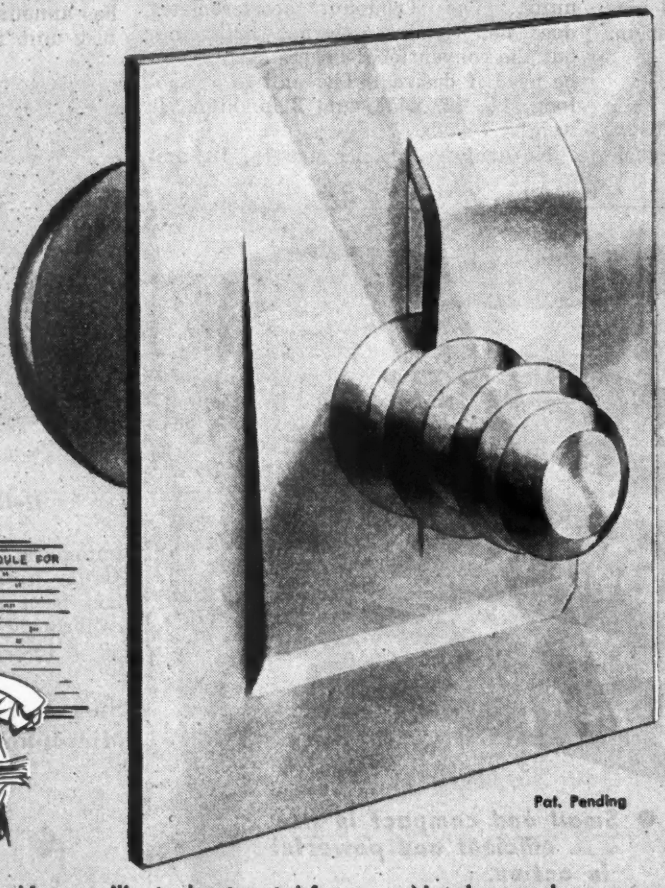
This 50-tube inclined tube manometer is designed for use in wind tunnel research laboratories, and may be adapted for use in low pressure, medium pressure, high speed or super-sonic wind tunnels. It may be used with a wide range of indicating fluids of different specific gravities. A leakproof, multiple-type tube connector is available for making rapid connections to the instrument.

Rubber Material Protects Helicopter Rotor Blades

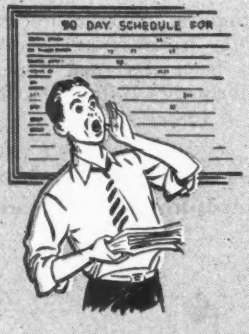
A rubber material to protect high-speed helicopter rotor blades from the

(*Turn to page 76, please*)

"Call out" STALOCK*



Pat. Pending



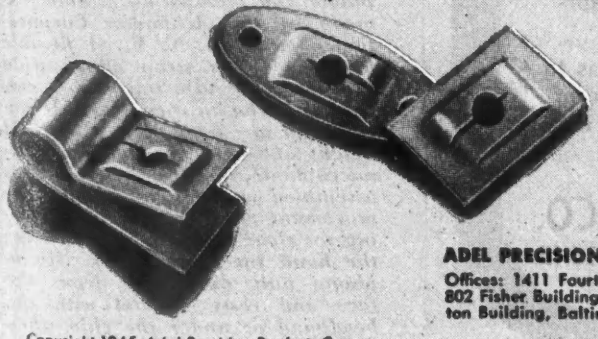
The "all around fastener"

ONE-PIECE
RESILIENT
SELF-LOCKING
RE-USABLE
SAVES WEIGHT
CUTS COSTS AND ASSEMBLY TIME
NO SHARP EDGES NOR VULNERABLE "FINGERS"
AAF RATING (AAF 25533)

For one-piece, self-locking, resilient, sheet metal fasteners that *stay locked*, "call out" for STALOCK, the "all around fastener". Finds its own way on screw threads. Tightens with screw driver without need of wrench. Eliminates lock washers and bearing washers. Provides "all around" safety, strength, endurance and resistance to vibration. Grips "all around" with 360° thread engagement. **Meets and exceeds specifications (AAF 25533) and has been awarded AAF Rating.** Positive locking action. No sharp edges nor vulnerable "fingers". Saddle, anchor, flat types and a wide variety of other types and sizes are available. STALOCK may be formed as integral part of your assembly. ADEL provides low cost stampings made to your specifications, thus eliminating extra part. **Industrial Users**—investigate the time-saving benefits of STALOCK PUSH-ON fasteners for assemblies using metal or plastic threadless studs, rivets—even nails. For specifications and technical data, write Department N-503.

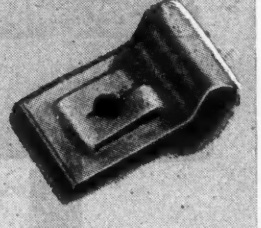
Look to ADEL for products of *Design Simplicity* and *DEPENDABILITY*

● MADE BY ADEL—WORLD'S LARGEST MANUFACTURER OF AIRCRAFT LINE SUPPORT CLIPS AND BLOCKS. 13,000 TYPES AND SIZES. OVER 250 MILLION IN SERVICE.



ADEL

Trade Mark



ADEL PRECISION PRODUCTS CORP. • Burbank, California • Huntington, W. Va.

Offices: 1411 Fourth Ave., Seattle 1, Wash.; 421 Mutual Home Building, Dayton 2, Ohio; 802 Fisher Building, Detroit 2, Mich.; 303 Wareham Building, Hagerstown, Md.; 914 Lexington Building, Baltimore 1, Md.; 353 International Building, New York 20, N.Y. In Canada: Railway and Power Engineering Corp., Ltd.

Copyright 1945 Adel Precision Products Corp.

* Trade Mark

abrasive effects of sand and rain was recently disclosed by the United States Rubber Co.

The rotor blade tips attain a speed of more than 325 miles per hour, bringing strong air pressure against the fabric surfaces. Engineers of the United States Rubber Company were asked to design the protective rubber strips after the blades on several machines had been damaged by abrasion.

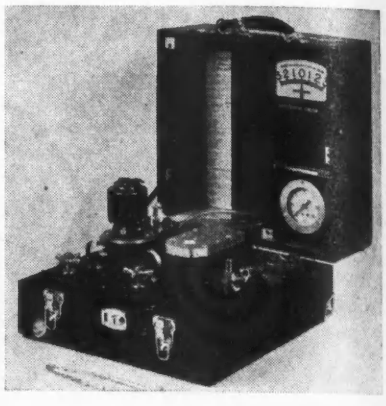
Angular Accelerometer

Trimount Instrument Co., Chicago, Ill., offers a new design, highly sensitive angular accelerometer for measuring pitch, roll, or yaw accelerations of airplanes, ships, locomotives, automobiles and other vehicles. The design includes an iron core which moves with respect to the coils of a differential transformer, which is in contrast to the conventional system of two-arms-of-a-bridge that requires external balancing units. The Trimount accelerometer does not require external balancing, but the conventional bridge system can be used if desired. The unit is 5½ in. long, 1⅛ in. wide, and 3 in. high. It weighs 1¾ lb.

Natural frequencies are 14, 18, and 22 cps. Higher frequencies can be obtained by substitution of a spring. Carrier frequencies up to 30,000 cps have been used.

Portable Test Unit for Aircraft Carburetors

Holley Carburetor Co., Detroit, Mich., has announced production of a portable test unit for testing the manual and



Holley portable test unit

automatic mixture control units of Holley aircraft carburetors. The unit has been designed for checking and calibrating Holley Models 1375 and

(*Turn to page* 106, *please*)

Suspension Boom Lip Microphone and Headphone

This suspension boom lip microphone and headphone assembly is made by the Aviometer Corporation, New York, N. Y. A flexible head and chin strap allows wide latitude for adjustment of earphones to the most comfortable position on any head. The tiny light weight anti-noise 100 ohm carbon microphone, in a plastic closure, is assembled with a swivel boom. Easy movement permits correct positioning for clear transmission and frees the hand for other duties. Microphone unit disappears from the face and rests parallel with the headband or under the chin when not in use.

Put the
BUELL AIR COMPRESSOR
in your post war picture

- *Small and compact in size . . . efficient and powerful in action.*
- *Precision workmanship assures long service without frequent parts replacement.*

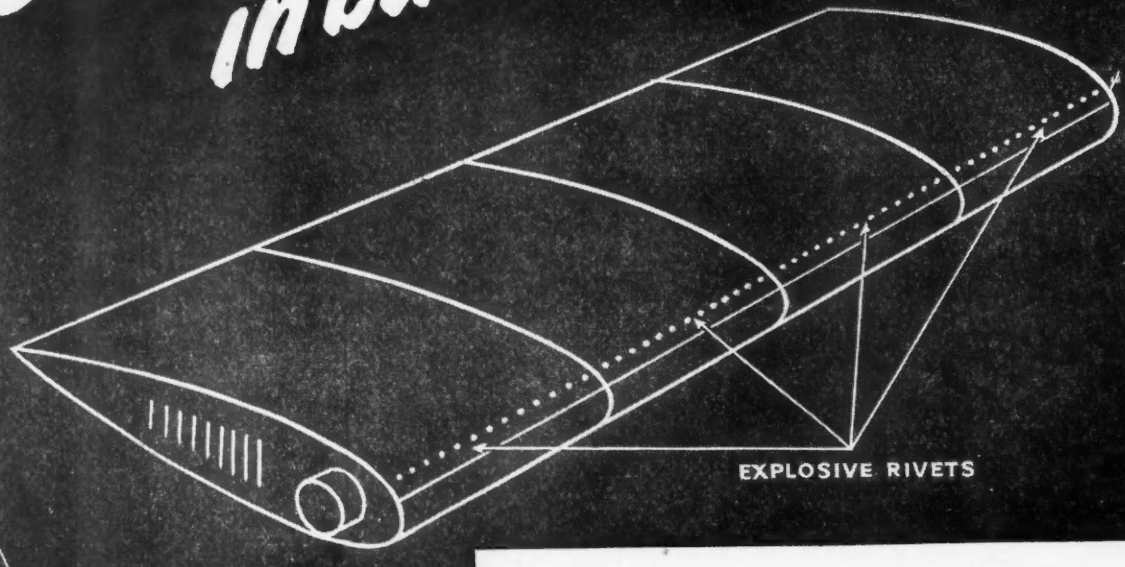
Put air to work! It is clean, powerful, reliable and economical. The many ways in which it can serve your needs may surprise you. Thousands of BUELL high speed compressors are in active service in Canadian fighter and bomber planes.

Designed for compactness and light weight, they are far more efficient and powerful than their size indicates. Let us prove their adaptability to your needs.

Write us, advising all details as to volume, pressure, etc., and our engineers will gladly aid you with your problem.

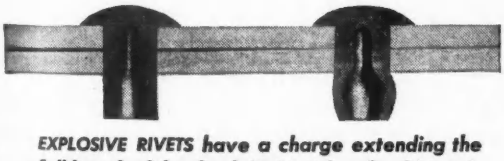
BUELL MANUFACTURING CO.
Dept. AA 2975 Cottage Grove Ave., Chicago 16, Ill.

Saving man-power in building B-29s



...another new application for Du Pont Explosive Rivets

LANDING FLAPS (above) *for B-29 Superfortress designed so that leading-edge skins can be attached with time-saving Explosive Rivets.*



EXPLOSIVE RIVETS have a charge extending the full length of the shank (left). *When fired* (right), *the entire shank expands... completely fills the hole and provides a strong, tight joint.*

DU PONT EXPLOSIVE RIVETS

The only one-piece blind rivet

The Briggs Manufacturing Company, Detroit, Mich., obtains a substantial saving of time in manufacturing landing flaps for Boeing Superfortresses by using Du Pont Explosive Rivets.

Explosive Rivets can be set in less than two seconds! It's an easy, one-man job. There are only two simple steps: 1. Insert rivet in hole. 2. Fire it. Result: a strong, tight, completely finished job of riveting.

Because of the advantages of Explosive Rivets for blind riveting and for hard-to-reach spots, leading aviation engineers design for them. Take advantage of this economical blind fastener. Let it help simplify *your* design. Write for descriptive manual. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington, Delaware.

Invest in VICTORY . . . Buy War Bonds

DU PONT

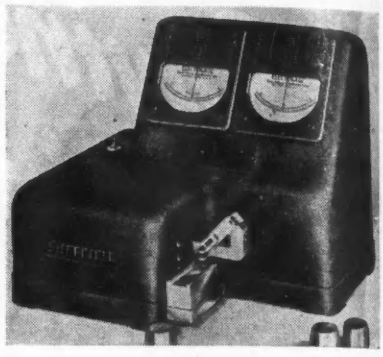
REG. U. S. PAT. OFF.

New Products

Bearing Contour Comparator With Electrigage Heads

A bearing contour comparator with Electrigage heads has been brought out by The Sheffield Corporation, Dayton, Ohio. The gage checks barrel shaped bearing rollers for correctness of contour only. No direct check is made on any diameter. The bearing slides into gaging position on two rails, coming to rest against the fixed center arm and lower roller backstop. The upper roller is spring-loaded to exert enough pressure on the bearing to keep it in gaging position while being rotated for the complete contour check.

The upper and lower arms at the left do the gaging while the middle arm is fixed for positioning the bearing roller. The gaging fingers move reed mechanisms which in turn actuate the Electrigage heads. The middle arm is adjustable for various contours. All three arms at left have tungsten carbide inserts for long life.



Sheffield bearing contour comparator

Wherever accuracy is important... so is accuracy CONTROL!

● Close-limit machine work calls for inspection standards regularly checked and re-established wherever necessary. Equipment for this kind of gage-testing used to be very costly. But not now. Johansson Gage Blocks are priced as low as $23 a set, with case—$3.50 for single blocks. They come in accuracies of .000004 and .000008. They will put your shop on a basis of enduring accuracy. May we send you a catalog with full details—sizes, accessories, prices? Write today.

FORD MOTOR COMPANY
Johansson Division
Dept. AA- Dearborn, Mich.

Every shop that works to thousandths or closer—whether on production, adjustments or repairs, needs—

Ford

Johansson

GAGE BLOCKS and ACCESSORIES

New Formula Liquid Belt Dressing

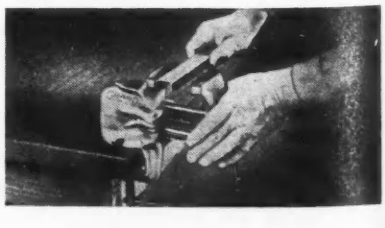
Graton & Knight Co., Worcester, Mass., is introducing a new formula liquid belt dressing. Although it will be marketed under the familiar "Grako" trade name, it is a distinctly new product.

The most important quality of a belt dressing is its ability to restore power transmission capacity to transmission belts. Tests with the new Grako are said to show an improvement of 15 to 20 per cent in transmission from rating upward, with a greater percentage rise for belts which are pulling under their rating.

Quick-Action, Alloy Steel Machinist's Vise

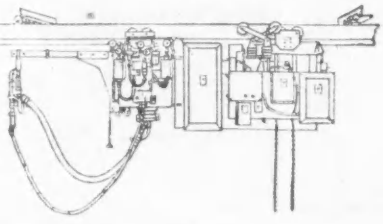
Grand Specialties Co., Chicago, Ill., is producing a new "quick-action" machinist's vise. Known as the Grand 3-inch Quikcet alloy-steel machinist's vise, it is manually operated but eliminates running in or out the screw to close or open the vise. It is claimed that this new speed vise can be set and closed in a jiffy by simply pushing on

(*Turn to page 82, please*)

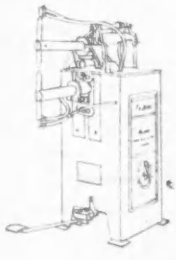


Quikcet machinist's vise

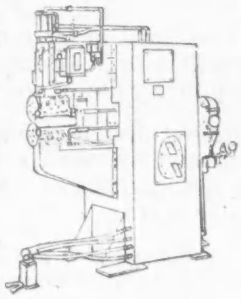
to Metal, Costs...



gun type resistance welder, an example of which is the overhead rail unit which can be rolled up and down an assembly line and allows operator a wide radius of travel about the work (see above)... Spot welders, from small utility rocker arm types (see left) to heavy duty units capable of welding sheets up to 3/8 inch each have wide use in the metal working industry ... Roll spot and seam welders have equally broad application, produce a continuous or intermittent weld, automatically indexed...and many other cost saving types.



Federal wants to make available to you full information on applications of resistance welding to better and faster fabrication. We want to bring you up to date on resistance welding as a tool for modern production. Federal is ready to help if you will tell us WHAT YOU WANT TO KNOW ABOUT RESISTANCE WELDING.



Consult "the name of authority on resistance welding".

Federal WELDER CO.

220 Dana Street
WARREN, OHIO

VERSATILE MODERN PRODUCTION TOOLS

BARREL WELDERS

Of the millions of welded steel drums or barrels used to distribute gasoline and oil to our mechanized war in far corners of the earth, a vast majority are welded on Federal Barrel Welders. Not only has a major percentage of the industry for many years been equipped with Federals, but The Federal Machine and Welder Company designed and built several complete barrel manufacturing plants set up by the army at distant bases to augment the tremendously increased output of the home industry.

Seam welds (resistance welded) in such containers must be able to take terrific punishment. Immediately after welding, the barrel shells pass through a machine which forms two rolling rings in the side, by stretching the steel outwardly under great pressure. Then, too, the loaded barrels, weighing over four hundred pounds, often are dropped a distance that subjects them to thousands of pounds impact. The weld must hold.

NEW FOLDERS

Most recent informative bulletins on Federal Resistance Welders to come from the press are the new "Type R" bulletin describing a complete line of rocker arm utility spot welders . . . and "Type P" Bulletin with details of Federal's Press Welders, used for projection welding, mash welding, etc. Bulletins are available now on request.

HOUSEWARE PRODUCTION

Anticipated expansion of houseware production points up the advantages of Federal resistance welding for the fast, low cost application of handles to enameling steel or aluminum pots and pans. Press type welders are used, with dies that permit rapid loading, give production of 500 to 800 handles per hour, depending upon type of handle applied. Cost with one manufacturer is one-fifth previous methods.

INTERESTING PLANT

Full details of a complete manufacturing plant for high production of large resistance welded tank turret rings (up to seven feet OD) are in a book just released by The Federal Machine and Welder Company. The company designed and built the entire plant, shipped to a foreign power. Point of interest is that similar rings, which can be made with same equipment, could be used for large ring gear blanks, rotating table bearings, possibly locomotive tires. Limited number available to executives, technical men, sufficiently interested to write to Federal giving name, official title and company name.

MILLIONS MORE to come on *New* cars, *New* models

In prewar days, millions of automobiles were equipped with Harris compressed rubber shackles and bearings* as original equipment. Millions of these automobiles, still in active service, have the same Harris rubber shackles and bearings and will always have them because their span of life is longer than that of the car.

Today, the U. S. armed forces are using mobile units equipped with Harris compressed rubber shackles and bearings.

Tomorrow's new cars and new models will also have Harris rubber shackles and bearings, because they never require lubrication, are low in cost, easy to install, quieter, catch and absorb jolts, jars, and vibrations, and prolong life of the car.

Automobile manufacturers are blue-printing designs for post-war production which will include Harris compressed rubber bearings for the oscillating joints of spring shackles, radius rods, shock absorber links, suspension arms, etc.

Manufacturers in other fields are also equipping their products with Harris compressed rubber bearings, vibration eliminators such as Torflex Bearings, Duflex instrument mounts, engine mounts and Torflex Couplings.

Vibration is death to any and all types of machinery. Harris engineers can correct and eliminate most of that vibration, thereby prolonging the life of machinery and improving the performance of it regardless of shape, size or type.

HARRIS PRODUCTS COMPANY

Specialized Rubber Engineers and Sole Manufacturers of
Duflex VIBRATION INSULATORS (MOUNTS)
Torflex BEARINGS
Torflex COUPLINGS
HARRIS COMPRESSED RUBBER BEARINGS

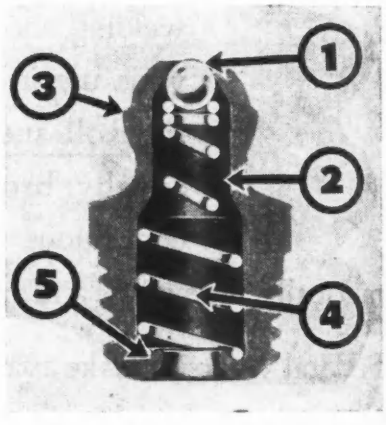
HARRIS PRODUCTS COMPANY
CLEVELAND 4, OHIO, U. S. A.

body of the free jaw, which slides in swiftly on ratchet screw and two guide rods and tightens with a turn of the handle. The vise is equipped with a trigger release pawl with ¾ in. of thread which holds the hardened screw under spring tension. Vise is said to open instantly to 3 in. by pressure of thumb or finger on trigger release after tension has been eased by single turn of the loose-proof handle. The Quikcet vise is then ready, without further adjustment, for instant closing on any other work.

Improved Grease Fitting Now Available

A new grease fitting known as the Bullneck is now made available for civilian use by the Lincoln Engineering Co., St. Louis, Mo. This fitting was originally developed by Lincoln for use on heavy military and transport vehicles. Only one type of coupler is needed for contacting the fittings.

Some of the features of the Bullneck



Lincoln Bullneck grease fitting

fitting are: flush ball check, larger grease passage, bearing pad for coupler jaws, non-collapsible spring, and a construction which prevents forcing the spring out at the base.

Lincoln Bullneck fittings are machined from steel bar stock, hardened throughout, and zinc plated.

Arc-Welding Electrode For High-Tensile Steels

A new heavily covered arc-welding electrode for welding low-alloy, high-tensile steels has been announced by the General Electric Company. Specially designed for use on carbon-molybdenum steel in the high-pressure piping industry, this electrode may also be applied to vessels (fittings) and structural weldments of innumerable kinds.

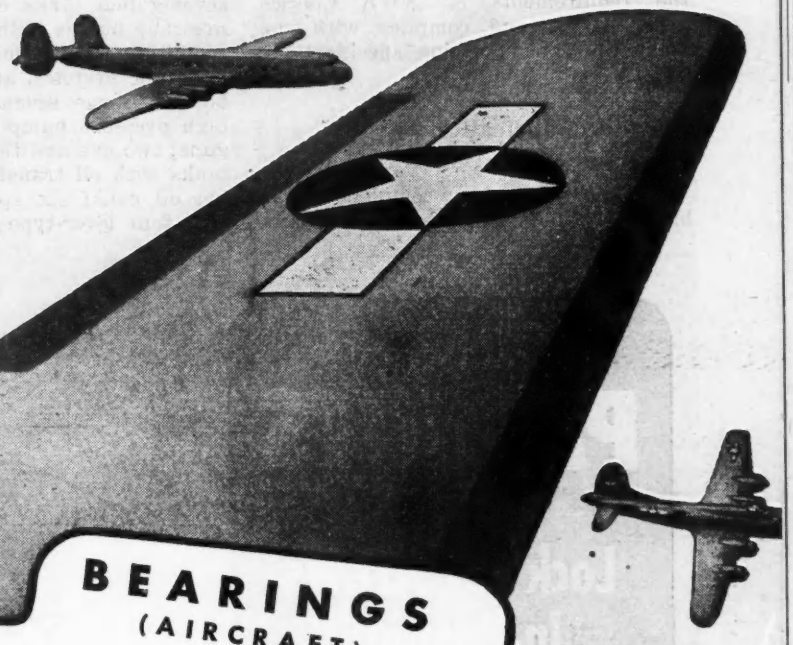
Known as Type W-56, the new electrode operates satisfactorily on either alternating current, or direct current, reverse polarity, and its range of current is sufficiently broad to cover a wide

(*Turn to page* 84, *please*)

Another tough cleaning problem solved by "THE PENN SALT MAN!"

THE aircraft industry has offered some of the toughest metal cleaning and plating problems in war production plants. It has been our privilege to be helpful through our products and our men in the solution of many such problems. Both the men and the products of Penn Salt's Special Chemicals Division are prepared not only for these war-time services but are equally well prepared for reconversion and the problems of the future.

Here is an actual case of a leading aircraft engine manufacturer, drawn from our files:



BEARINGS
(AIRCRAFT)

PRODUCTS USED: PENNSALT CLEANERS EC-10, No. 37, and K-7 BEFORE LEAD PLATING WITH PENNSALT LF-42

PROBLEM: To remove slushing oil from copper-lead alloy and silver plated steel bearings prior to lead plating.

EQUIPMENT: Plating done in individual pyrex glass plating tanks, large enough to accommodate one bearing. Conventional soak and electrolytic cleaning tanks.

OUR METHOD:

1. Preclean with Pennsalt EC-10 (solvent dip) followed by spray water rinse.
2. Soak clean in Pennsalt #37, 6 oz/gal., 5 to 10 minutes, 190 to 200° F.
3. Hot water rinse.
4. Electroclean in Pennsalt K-7, 8 oz/gal., 190° F., 15 to 30 seconds—work made the cathode.
5. Hot water rinse.
6. Lead plating solution made up of one part Pennsalt LF-42 to two and one-half parts water —with glue addition. Used at room temperature, 15 amps./sq. ft., for 28 minutes, which plates .001" thickness.
7. Cold water rinse.
8. Cyanide dip.
9. Indium plate.

COMMENTS: This cycle employs four Pennsalt Products.

"THE PENN SALT MAN" FIRST A TECHNICIAN . . . THEN A SALESMAN

Penn Salt Special Chemicals Division men are well trained in the application of chemicals to industry's problems. If you have a metal cleaning problem, don't hesitate to seek the advice of "THE PENN SALT MAN." He will advise you without obligation.

SPECIAL CHEMICALS DIVISION

PENNSYLVANIA SALT
MANUFACTURING COMPANY
Chemicals

1000 WIDENER BUILDING, PHILADELPHIA 7, PA.
New York • Chicago • St. Louis • Pittsburgh • Cincinnati • Minneapolis • Wyandotte • Tacoma

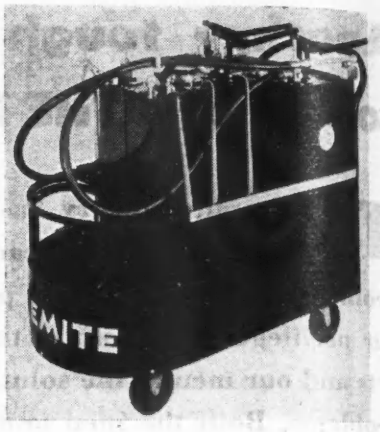
range of plate thicknesses. It can be used in the flat, vertical, and overhead positions. Moreover, it produces a relatively flat deposit, particularly in the vertical position.

Available in sizes ⅛, 5/32, and 3/16 in. in diameter, the new electrode meets the requirements of AWS Classes E7010/E7011 and complies with the Navy Bureau of Ships specifications 46E2.

Portable Lubrication Department for Plants

Designed to provide a complete, portable lubrication department for industrial plants, with ability to transport and dispense a variety of grades or types of lubricants, a new Lubrikart has just been announced by the Stewart-Warner Corporation.

The new Lubrikart comes in two models. The basic model carries two seven-gallon tanks equipped with low pressure pumps with hose and nozzles for filling oil reservoirs on machines or hydraulic systems, and for filling gear housings; one seven-gallon tank with high pressure pump for loading handguns; two one and three-quarter gallon tanks with oil transfer pumps for filling oil cans; six spout-type oil cans, and, four lever-type handguns.



Alemite Lubrikart

The second model has, in addition to the foregoing equipment, a high-pressure, hand-operated grease pump which holds thirty pounds of lubricant and has a five and a half foot lubricant hose fitted with a hydraulic coupler.

Granite Surface Plates

Accuracy to 0.0001 in. when gaging points, laying out drill jigs, dies and fixtures, is said to be possible with granite surface plates offered by the Ideal Commutator Dresser Co., Sycamore, Ill. These surface plates are made of Vermont granite, ground and lapped to precise tolerances.

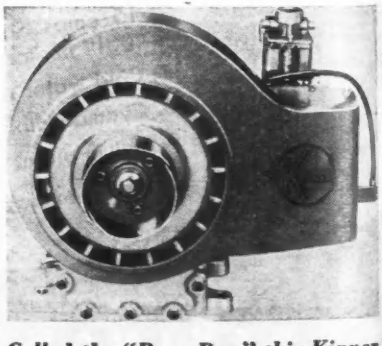
Ideal granite surface plates are available in a wide range of sizes from 8 in. by 10 in. to 30 in. by 72 in. Larger sizes are made to special order.

Alloy Tool Steel Welding Rod

Toolface, made by the American Manganese Steel Division of American Brake Shoe Co., Chicago Heights, Ill., is a super-hard and tough alloy tool steel welding rod composed of high carbon,

(*Turn to page 86, please*)

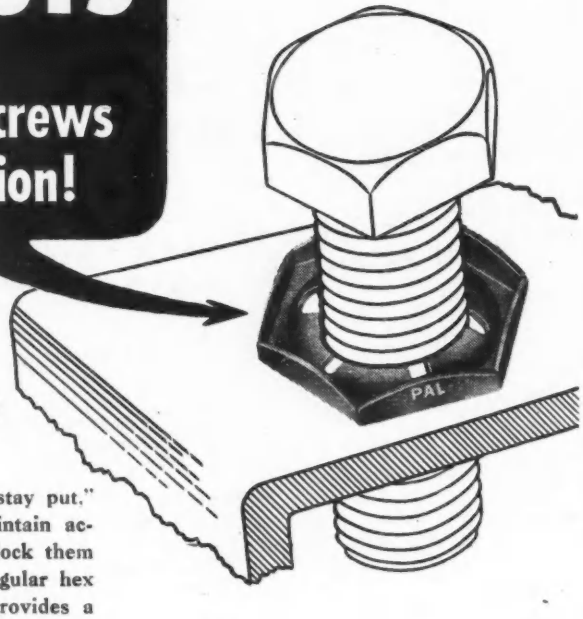
Small Air-Cooled Engine



Called the "Busy Bee," this Kinner Model AB-3, made by Kinner Motors, Inc., Glendale, Cal., is an air-cooled, 4-cycle, L-head engine rated 5 hp, at 2600 rpm, but develops 6 hp at 3250 rpm. The single cylinder is horizontal and detachable, making maintenance easier. Bore is 2¾ in., stroke 3 in., displacement 17.8 cu in.

Use
PALNUTS
To
Lock Set Screws
In Position!

Hold Accurate Settings Under Severest Vibration



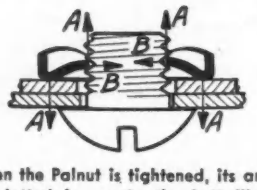
A set screw that won't "stay put," is soon valueless. To maintain accurate set-screw settings, lock them with Palnuts instead of regular hex nuts or jam nuts. This provides a powerful double-locking action* that is unmoved by severe, prolonged vibration.

Single thread, tempered spring steel Palnuts require only 3 bolt threads space. They spin on fast with fingers, lock tight with ¼ to 1/3 turn of wrench. Cost no more, and frequently less, than regular nuts; may be re used. Full line of sizes in National Coarse and National Fine Threads.

WRITE for Palnut No. 2, giving engineering data on Self-locking Palnuts. Outline requirements for samples.

The Palnut Company, 60 Cordier St., Irvington 11, N. J.

*Double Locking Action

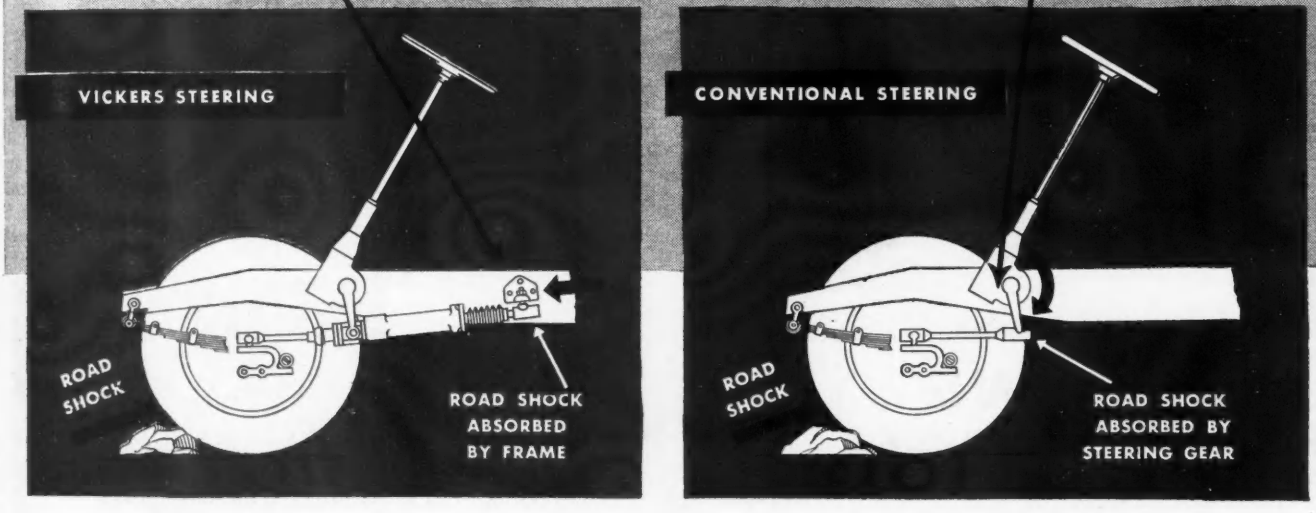


When the Palnut is tightened, its arched slotted jaws grip the bolt like a chuck (B-B), while spring tension is exerted upward on the bolt thread and downward on the part (A-A), securely locking both.

Self-Locking PALNUTS

VICKERS Hydraulic POWER STEERING

Transmits Road Shock Thrusts to the *FRAME... instead of to the Steering Gear*



With Vickers Hydraulic Power Steering, no road shock can be transmitted to the steering gear and to the driver . . . road shock thrusts are transmitted to the frame. A vehicle can be driven over the curb, through sand, and on rough ground with no "fight" from the wheel. A flat tire will not cause swerving. A light touch on the steering wheel is sufficient at all times.

Among the many other important advantages of Vickers Hydraulic Power Steering are: greater driver efficiency by reducing fatigue to a minimum, easy application to existing chassis designs, automatic overload protection for both hydraulic system and steering linkage, and 15 years of successful operating experience on trucks, buses, road machinery, etc. Ask for Bulletin 44-30 which contains complete information about the Vickers Hydraulic Power Steering System.

VICKERS *Incorporated* **1428 OAKMAN BLVD. • DETROIT 32, MICH.**

Application Engineering Offices: **CHICAGO • CINCINNATI • CLEVELAND • DETROIT • LOS ANGELES • NEWARK PHILADELPHIA • ROCHESTER • ROCKFORD • TULSA • WORCESTER**

VICKERS Hydraulic POWER STEERING is Simple . . . Compact . . . Easily Installed

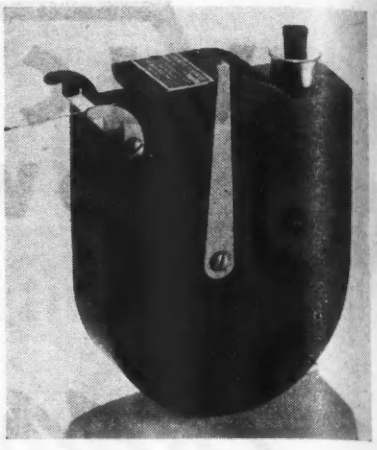
high chromium, high molybdenum, tungsten and vanadium; commonly known as high speed steel. Its welded deposits have a Brinell hardness of 575 to 675, depending on the dilution of the metal.

Toolface is said to be especially adapted for the production of composite cutting tools, including those used on lathes, shapers, milling heads, etc. Its ready weldability expedites the depositing of cutting edges or lands on mild steel bases or shanks.

Recording Galvanometer

The Brush recording galvanometer, a recent addition to the line of the Brush Development Co., Cleveland, Ohio, makes direct ink on paper chart recordings of wider frequency range and greater sensitivity than heretofore attainable.

It embodies a low-mass; 3-in. tapered tube recording pen, actuated by a permanent magnet penmotor utilizing newly developed material and techniques. The pyrex tipped pen records directly in ink on a moving paper chart, pressures, vibrations, strains, currents and voltages of frequencies from direct current to 120 cps. It has no overshoot up to 70 cps at a maximum swing amplitude of 20 mm each side of center line. Frequency response flat to 70 cps, accurate to 120 cps. Pen can be conveniently centered on, or raised from chart.

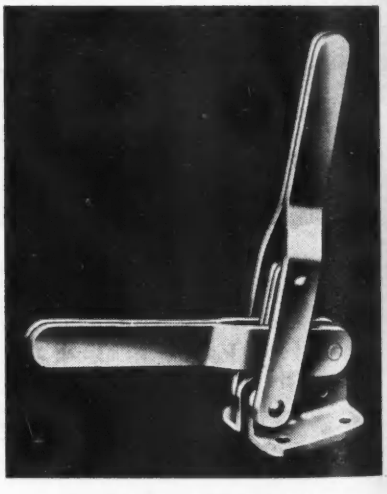


Brush recording galvanometer

Impedance of penmotor is 1500 ohms. Minimum sensitivity is 1.1 mm per volt, 1.6 mm per ma., 21 volts full scale.

Heavy Toggle-Action Clamp

To meet situations where extraordinary pressure is required for clamping at a angle to the base mounting, a new toggle-action clamp has been designed and recently placed on the market by Knu-Vise, Inc., Detroit, Mich. It is known as Model KV-221 and is slighly larger and sturdier than the company's model KV-220.



Knu-Vise model KV-221

This clamp can be used inside of jigs where operating space may be limited. It can be used also as a locating device in progressive drilling fixtures.

The clamp weighs 23 oz. and measures 7⅛ in. in height and 6⅛ in. in length. Its recommended load at the end of the standard toggle bar is 240 lb.

Continuous Cast Bronze

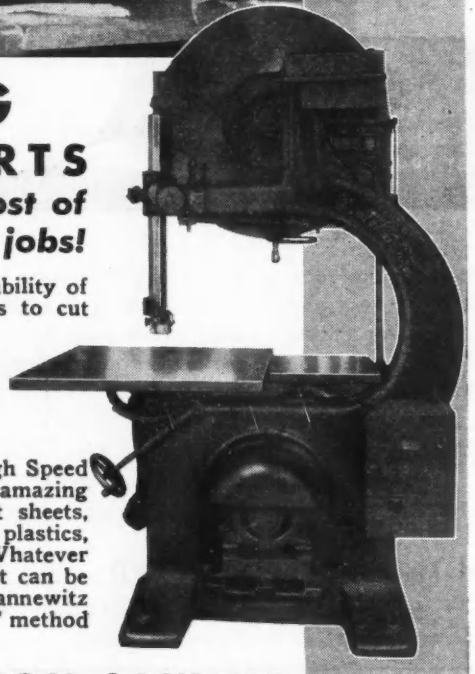
Certain bronze alloys previously available as sand, permanent mold, or centrifugal castings are now made by

(*Turn to page 90, please*)

The SUPER METHOD

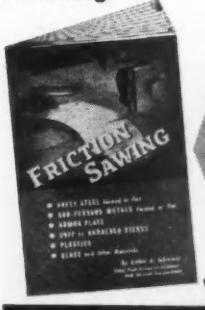
of TRIMMING FORMED PARTS

and performing a host of other metal cutting jobs!



The negligible down-drag and the ability of Tannewitz High Speed Band Saws to cut sheet metal from 90° to near 0 or 135° at tremendous speed make these machines ideal for trimming. Cuts can be made with perfect safety without using a rest of any kind.

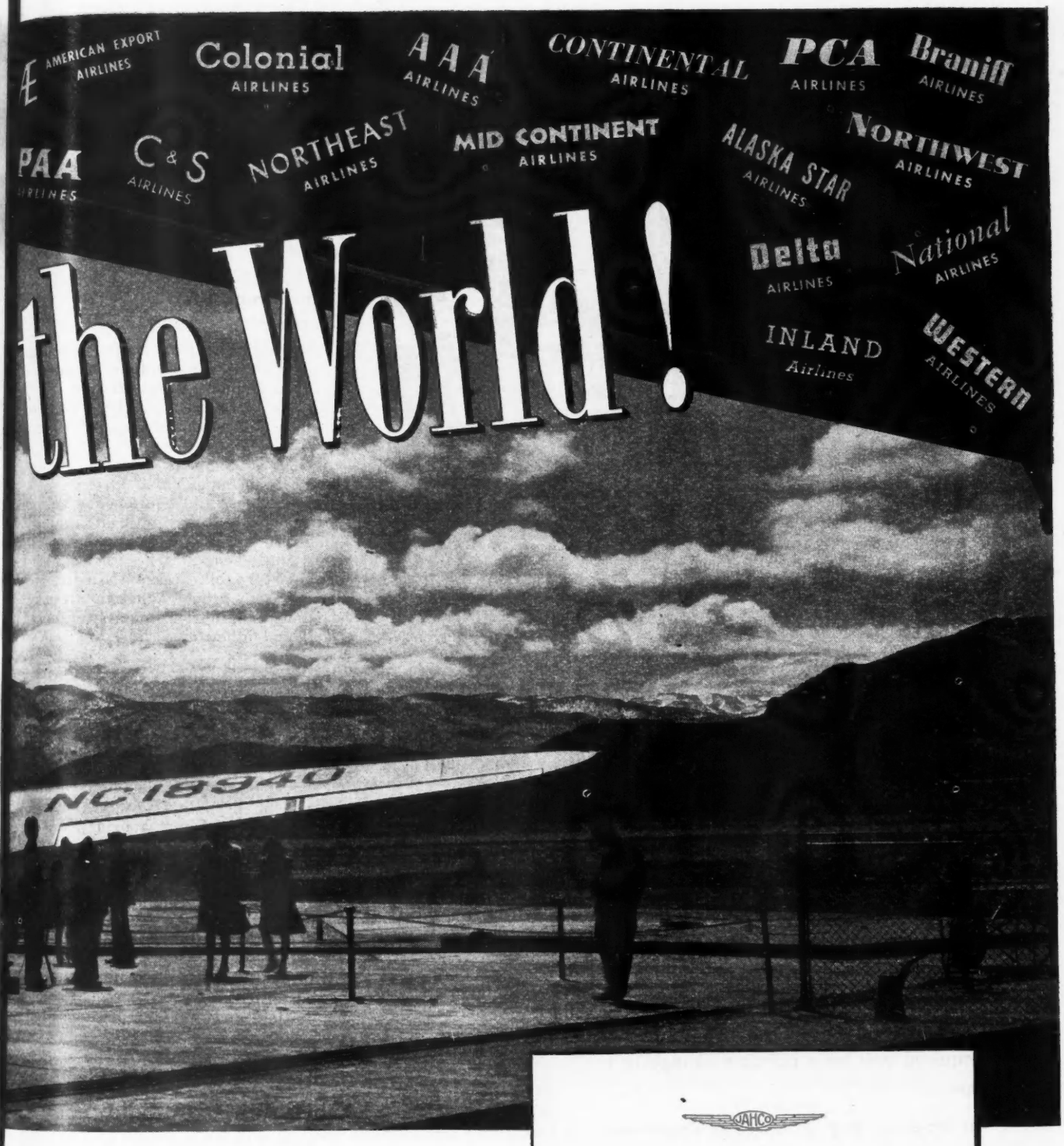
Friction sawing with Tannewitz High Speed Band Saws also results in perfectly amazing time savings in the cutting of flat sheets, soft or hardened steels, armor plate, plastics, glass and many other materials. Whatever your cutting problem, chances are it can be done better and faster with Tannewitz Band Saws. Investigate this "Super" method of cutting.



FRICTION SAWING with Tannewitz HIGH SPEED BAND SAWS

WRITE FOR YOUR FREE COPY

THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN



Buy More War Bonds and Stamps

the prewar load. Total passenger miles last year were nearly a billion higher.

If air transport can do such a tremendous job in the face of warborn shortages of personnel and equipment, what will it do in peace! With a great body of schooled pilots and mechanics to draw upon and available equipment of a quality, carrying capacity and operating efficiency that were scarcely dreamed of in the prewar days, the sky's literally the limit!

It will be a privilege for us to join forces with this industry in building the coming Age of the Air!

Look to Jack & Heintz for better things for flying!

JAHCo

JACK & HEINTZ
Incorporated

ARMY E NAVY

Jack and Heintz Inc., Cleveland, Ohio, manufacturers of aircraft engine starters, generators, gyro pilots, gyro flight instruments, magnetos, motors.

at AMERICAN FORGING & SOCKET CO.
PONTIAC, MICHIGAN

American Forging & Socket Co. of Pontiac, Mich., installed their first Detrex Degreaser in 1942 for use in production of 100-lb. demolition bombs. Their second Degreaser, illustrated, is handling 260-lb. fragmentation bombs.

Detrex
DEGREASERS
CAN BE QUICKLY RECONVERTED

THIS company's peacetime products include a variety of stampings made up into assemblies for the automotive industries. When manufacture of such parts is resumed, their present Detrex Degreasers will fit right into the production picture. Parts to be cleaned will be loaded into baskets carried by the same hooks on the same conveyors that are now carrying bomb forgings, and the only alteration required will be a possible change in the conveyor speed.

In the same way, ALL Detrex Degreasers are readily adaptable to changing production needs—whether for war or peace—usually with little or no alteration.

In speed, thoroughness, economy—in adaptability, too—Detrex is your best buy in industrial metal cleaning.

BUY MORE BONDS

DETREX Corporation
13001 HILLVIEW AVE.
DETROIT 27 • MICHIGAN

Solvent Degreasers • Metal Parts Washers • Processing Equipment • Industrial Cleaning Chemicals

a continuous casting process at Ampco Metal, Inc., Milwaukee, Wis.

As the name of the process implies, the rod is produced by the continuous withdrawal of metal from the bottom of a casting crucible. The metal is solidified as it leaves the crucible and passes through a suitably cooled die of closely held dimensions. It is guided by driving rolls to a travelling cut-off device which engages at proper intervals to yield sound rods of good surface, uniform diameter and even length.

Transparent, Flexible Thermoplastic Tape

A transparent, flexible thermoplastic tape, facilitating inspection and servicing of equipment on which it is used, has been introduced by the Irvington Varnish and Insulator Co., Irvington, N. J.

Useful not only as electrical insulation, Fibron tape No. 3 also protects wiring, cables, and equipment against abrasion. The tape is heat sealing, flame resistant, flexible at low temperatures, and resists attack by acids, alkalies, moisture, oil, grease and corrosive fumes. With proper adhesives, it may be bonded to fabrics, metal, ceramics, wood, and other materials.

Support for Latex Cushioning Material

An innovation in post-war seating will be the introduction by United States Rubber Co. of a new type cushion support for latex cushioning material which, through its design, will incorporate the leaf spring principle into seating.

By use of the new seating base, the company will be able, after the war, to supply in volume complete cushioning units for installation in automobiles, buses, theatres, railroads, hotels, steamships, auditoriums and homes. Advantages are said to include simplification of construction, assembly and installation, space saving and greater comfort in seating.

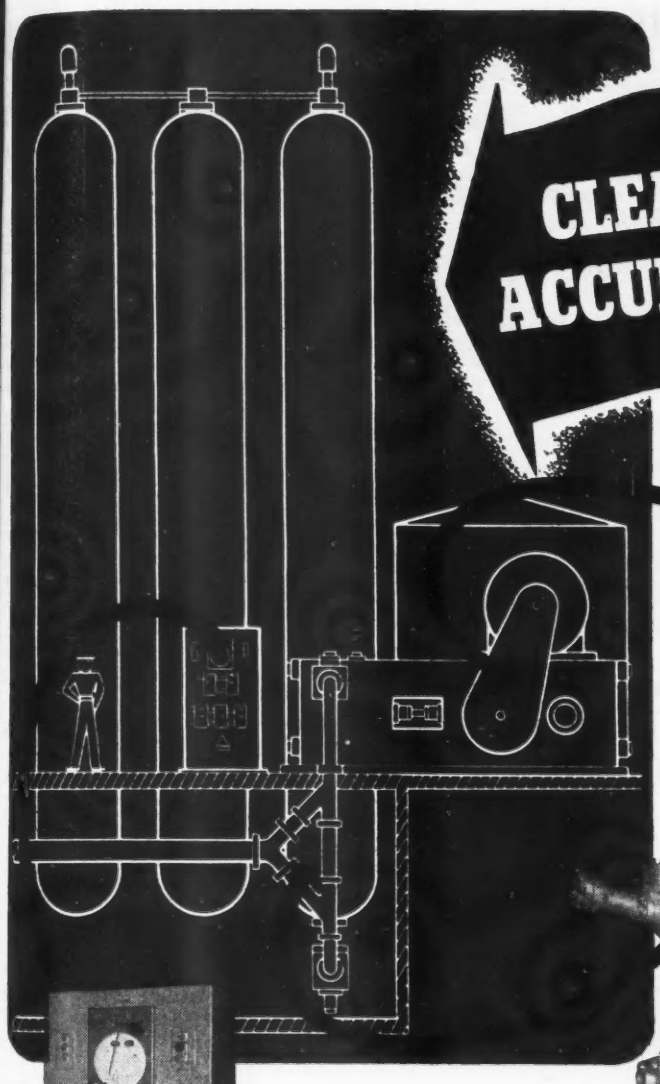
South Gate Plexiglas Fabricating Plant Sold

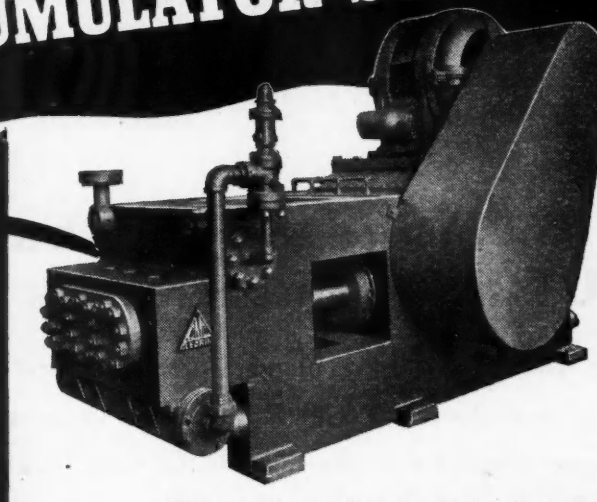
The announcement of the sale of their South Gate, Cal., Plexiglas fabricating plant to Shellmar Products Corporation of Mount Vernon, Ohio, was made public by the Rohm & Haas Company of Philadelphia.

The sale of the South Gate plant, Rohm & Haas officials stated, is in keeping with their established policy of withdrawing from commercial fabrication of Plexigas except insofar as is necessary for the development of improved fabricating processes. This work will be carried on at the Bristol, Pa., plant of the company.

Effective with the transfer, all Rohm & Haas fabricating orders for the West Coast will be transferred directly to Shellmar.

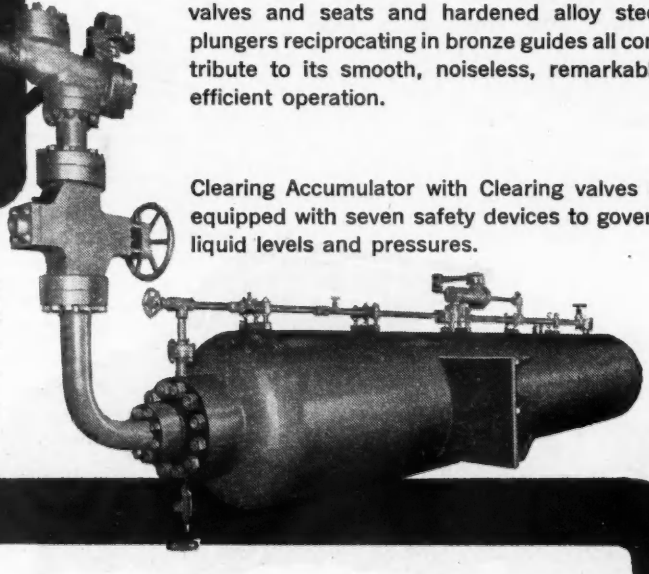
CLEARING HYDRAULIC ACCUMULATOR SYSTEMS



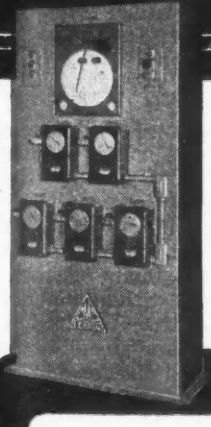


This belt-driven Clearing Hydraulic horizontal pump has fully enclosed crankless drive running in oil. Anti-friction bearings, alloy steel valves and seats and hardened alloy steel plungers reciprocating in bronze guides all contribute to its smooth, noiseless, remarkably efficient operation.

Clearing Accumulator with Clearing valves is equipped with seven safety devices to govern liquid levels and pressures.



The unusually simple Clearing Automatic Control does a perfect job of controlling loading and unloading of pumps at predetermined and adjustable pressures.



Products of the same engineering skill and ingenuity responsible for Clearing Presses, these Clearing Hydraulic Accumulator Systems give shockfree, reliable performance at all times. Designed for working pressures up to 6,000 PSI, Clearing Accumulators can be furnished in any capacity required for press installations of any size and type. The pressure demands for any operating speed or production rate can be met. Write today for detailed information. Please state your exact operating requirements. Clearing Machine Corporation, 6499 West 65th Street, Chicago 38, Illinois.

CLEARING MACHINE CORPORATION

6499 West 65th Street ★ Chicago 38, Illinois

MECHANICAL AND HYDRAULIC PRESSES FOR SHEAR OPERATIONS AS DRAWING • BLANKING • FORMING • FORGING

CLEARING ★

Features of the Lockheed Constellation

(*Continued from page* 42)

flight conditions. The pilot static masts are provided with anti-ice fluid outlets and the heads are electrically heated.

As the parts of the Constellation are necessarily bulky and heavy and must be moved by machinery, the design of the airplane incorporates a carefully laid out system of attachments for hoisting, jacking and towing. Repair and setting up operations can be accomplished with a minimum of time and with little danger of damage to the aircraft parts. Power plant changes can be made in less than 30 min, and the use of interchangeable power egg type nacelles permits rapid interchange of engines when major overhauls are necessary.

The airplane was designed for easy maintenance and a high degree of utilization. Operations to date indicate that 18 hr a day of in-commission time are possible as a routine matter.

Special tools for servicing have been developed by Lockheed which permit work on the Constellation to be done efficiently and without danger of damage to parts that might be caused by the use of standard tools.

Both hydraulic and electric controls are used on the Constellation, whichever seemed more practical. All automatic devices are seconded by emergency hand devices and provision for hand charging in the event of hydraulic failures is provided.

Lockheed Fowler wing flaps are actuated by two hydraulic motors located in the cargo compartment. The motors are cable controlled from the cockpit and, by means of a gear reduction unit, drive two shafts which are connected to gear boxes in the wings. A hand crank is provided as an auxiliary means of operating the flaps.

Inasmuch as large transports often operate for long distances over water, careful arrangements must be made for the safety of passengers and crew in case of a forced landing over water. Strategically located escape doors and inflated rubber type life rafts are provided.

Four fuel tanks are located in the wing inner panels and are built integrally with the wing. Four complete fuel systems are provided connected only by cross transfer lines. Fuel passes from the tanks, through electric pumps, which are used for starting and for high altitude operation, through flowmeters to the carburetor inlet ports. Each tank is provided with fuel dump valves operated by the pilot, which dump the fuel at the rate of 75 gallons per min. A surge box in each tank provides a steady flow of fuel to the tank outlet.

Instrumentation of the Constellation has been thoroughly studied, and layout of the cockpit was based on consultation with pilots and a study of flight requirements.

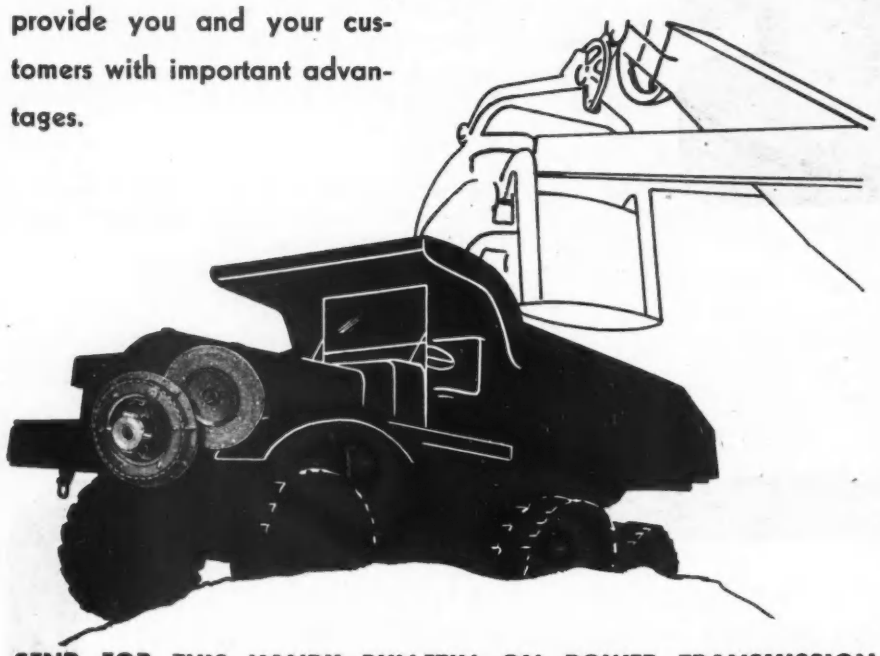
Flight characteristics of the airplane are excellent. The booster control system supplies maximum control for given control areas with minimum drag. The pilot at all times maintains the "feel" of the airplane since the cockpit control is connected directly to the control surface and the stick force provides a given percentage of the total control surface hinge moment at any given surface angle.

There is no tendency on the part of the Constellation to spin from a stall or slow steeply banked turn. Stalling characteristics are excellent with ample warning given of all stalls at from five to ten miles an hr above stalling speed. Landing speed is approximately 80 mph.

As I said in the beginning, the Lockheed Constellation is not only interesting in its features but also in the fact that many of its features will form the basis for the design of larger and heavier ships. Data gained from the operation of this airplane and developments that have been proved in its design and operation are already being studied in their application to larger and more advanced types.

✓✓ To Make Sure That Your CLUTCH Application Is RIGHT

Before you approve the blueprint for your post-war model — double check to see if it includes all the improvements you can give your product with the right ROCKFORD CLUTCH application. You are invited to utilize the clutch "know how" of our engineers to give your design the technical advances that will provide you and your customers with important advantages.



SEND FOR THIS HANDY BULLETIN ON POWER TRANSMISSION

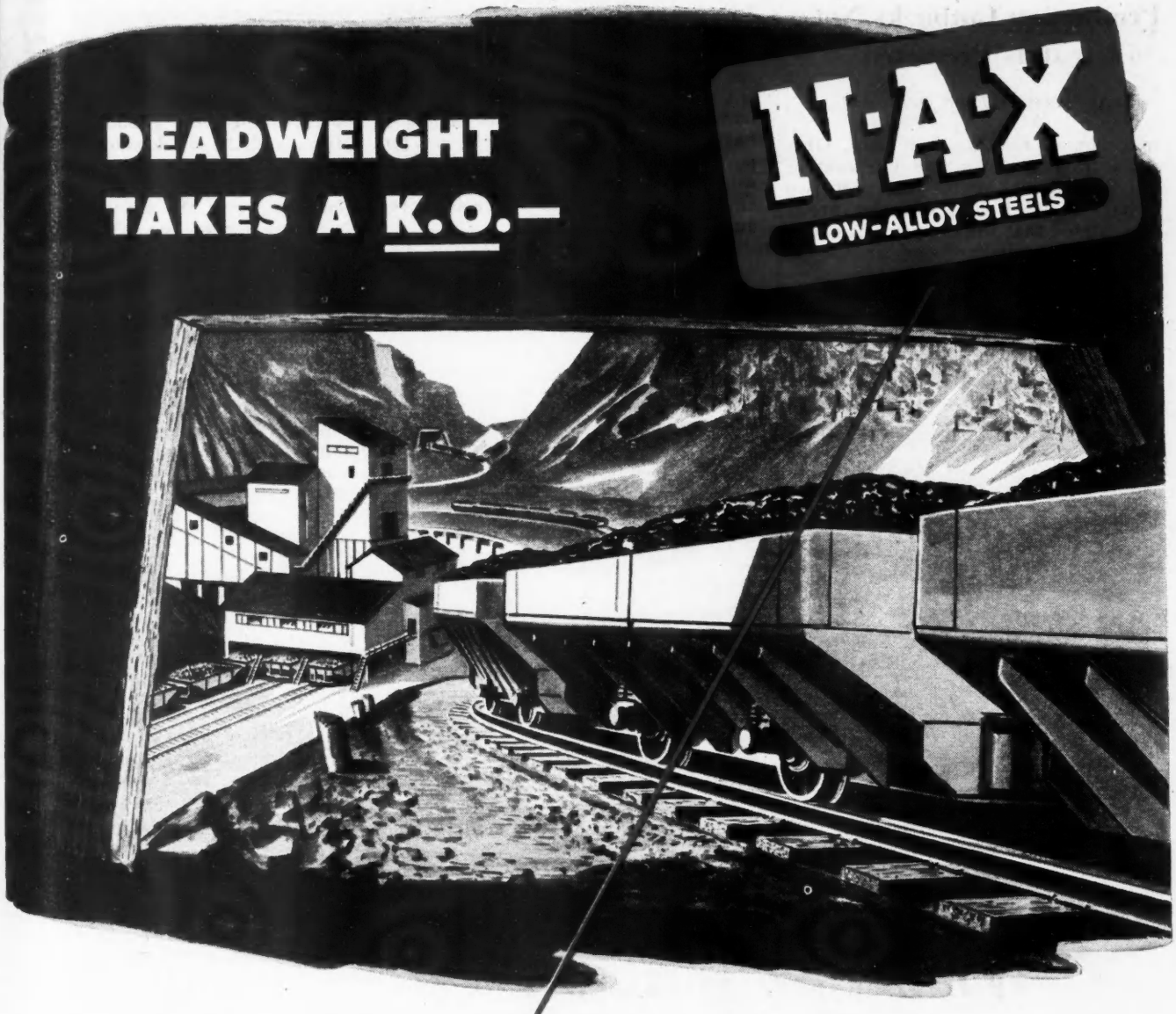
It shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications. Every production engineer will find help in this handy bulletin, when planning post-war products.

ROCKFORD CLUTCH [FORMERLY KNOWN AS] DRILLING MACHINE **DIVISION** BORG-WARNER CORPORATION

315 Catherine Street, Rockford, Illinois, U.S.A.

DEADWEIGHT TAKES A K.O.—

N-A-X
LOW-ALLOY STEELS



when these FINE-GRAINED STEELS take over

In N-A-X low-alloy steels, manufacturers of mining equipment have what it takes to *knock out deadweight* in the design of cars, elevators, conveyors, tipples, screens and stripping shovels.

It's the old "one-two punch" proposition. N-A-X High-Tensile provides the extra strength in stressed members to permit more efficient design, lighter construction. N-A-X 9100 Series steels do the same for constructional parts that call for accurate heat-treatment, with abrasion-resistance an important factor.

Take advantage of the great strength, exceptional ductility, good corrosion-resistance, excellent weldability and high resistance to impact, wear and fatigue that these fine-grained N-A-X low-alloy steels offer. Put N-A-X High-Tensile and N-A-X 9100 Series steels on the job to cut down deadweight, step up payload and increase the life of your equipment.

GREAT STEELS FROM GREAT LAKES

GREAT LAKES STEEL
Corporation
N-A-X ALLOY DIVISION • DETROIT 18, MICHIGAN
UNIT OF NATIONAL STEEL CORPORATION

Production Cutbacks Not So Great as Predicted

(*Continued from page* 44)

operation of the Anniston, Ala., Ordnance Depot, which the Corporation has been operating for the past two years. K. T. Keller, Chrysler president, stated that the company has been trying to streamline war production operations with a view to adding civilian automobiles and trucks, and that release from the Anniston contract will free personnel for reconversion work.

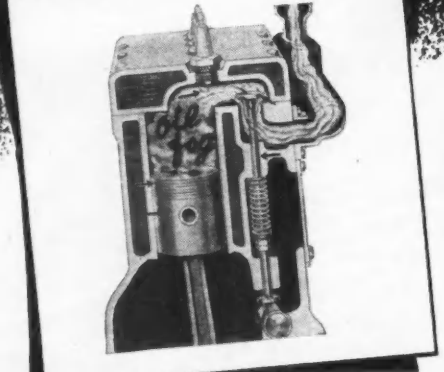
Nash has been notified of a major cutback in its propeller production at its government-owned Lansing plant with output of two types to be terminated by July 15. While the company has not announced its intentions for postwar use of the plant, its location would make it a logical choice for some kind of postwar use in automobile production.

Further indication of the waning need for full-scale, all-out war production in the Detroit area is seen in the announcement that Army Ordnance test work at the General Motors proving ground near Detroit will end by June 30. Henceforth all test work will be carried out at the main proving ground at Aberdeen, Md., the Chrysler-operated proving ground at Utica, Mich., and the Studebaker installation at South Bend. The overall picture is one of slow but steady reduction in war contracts, with the automotive manufacturers fitting partial reconversion facilities into the jig-saw pattern of continued war production on a reduced scale. By juggling machines, assembly lines, and other production facilities around, they will be able to carry on combined operations to the extent allowed by WPB.

The materials situation, on the other hand, is not so encouraging. Textiles appears to be the major obstacle at the moment, with the armed forces' requirements greatly increased for the Pacific war. D. U. Bathrick, general sales manager of Pontiac Motor Div. of G.M., states that approximately 56 yards of textiles were used in the prewar car, and unless some means is found to increase production or to devise satisfactory substitutes, car production may hit a real snag. He points out that 1000 cars require 4736 yards of broadcloth or 3748 yards of mohair, 3560 yards of head lining, 2316 yards of carpeting, 4761 yards of cotton sheeting, and 16,679 yards of burlap.

Plastics which may be woven may prove a satisfactory substitute for upholstery, he says, but these would provide only a small portion of the textile needs of a car, and would have to be tested thoroughly before being used. There is some effort now being made to channel manpower into eastern and southern textile industries, where materials and facilities are available if labor can be found to operate idle looms.

advise motor users:



Keep Valves, Guides, Upper Cylinder, Pistons, Rings

Oiled thru Carburetor

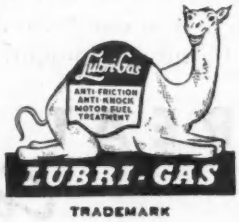
by treating your gasoline with

LUBRI-GAS

there's NOTHING else like it!

No mechanical system has ever been invented that assures constant, adequate lubrication of valves, guides, upper cylinder, pistons, rings. That is why sticky valves, burned and pitted valve seats, worn rings, and carbon and gum accumulations in upper cylinder are usually the first symptoms of motor trouble. Lubri-Gas Laboratories have developed an exclusive method of chemically processing 40 SAE lubricating oil, so that it enters the combustion chamber, through the carburetor, as an oil fog, and coats all upper cylinder parts with a film of clean oil. The results of this better lubrication are more power, more mileage per gallon, more pep, less wear and repair, freedom from carbon and gum and prevention of overheating and oil pumping. Now when it is so important to keep equipment in operation and out of the repair shop, LUBRI-GAS is indeed a God-send!

Send for Free Lubri-Gas File. Contains complete information about this modern motor fuel treatment.



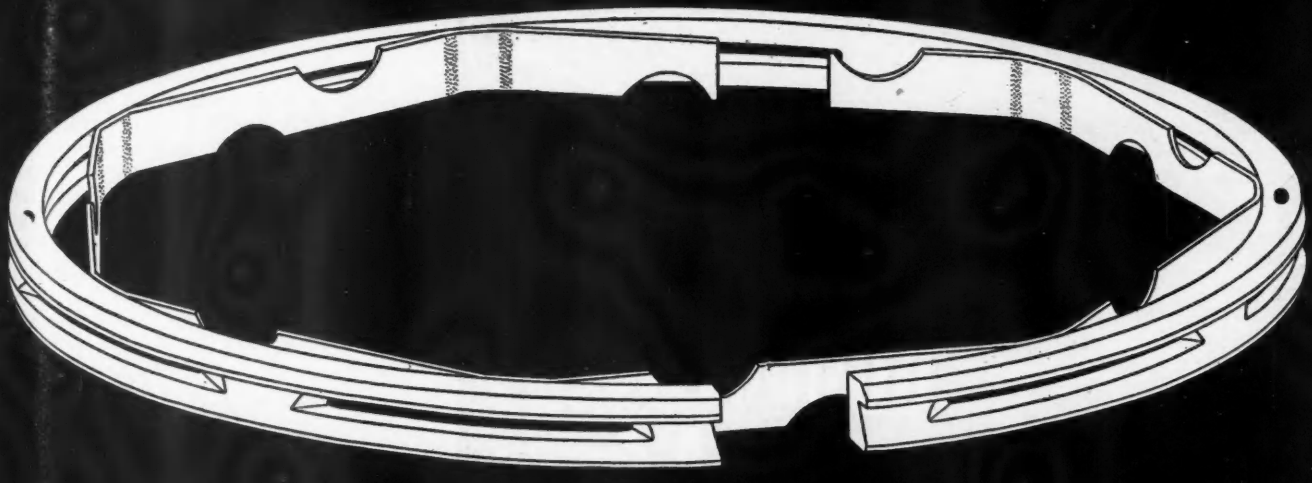
TRADEMARK

LUBRI-GAS 221 No. LaSalle St. Chicago 1, Ill.

Cleans and Lubricates as It Powers the Motor

BOOKS

HOW TO SPEED UP SETTLEMENT OF YOUR TERMINATED WAR CONTRACT, *by J. K. Lasser. Pub. McGraw-Hill Co.* At best the termination of war contracts will be a headache for people who run business whether it be large or small. This is due in large part to the complication of the sub-contracting system which has carried with it a chain of manufacturers pyramiding downward from the prime contractor. The author of this book, so widely known for his popular manuals such as "Your Income Tax," has followed the same pattern in constructing a manual to guide the perplexed when faced with a cancellation or curtailment of their war orders. It is not a text book. It is an instruction book showing what steps to take; what forms to use; whom to contact for clarification; etc. More valuable still is the statement of the procedure to follow when one is a sub-contractor. What to do about costs; what to do about inventories; how to calculate profits; how to get a T-loan; these and many other pertinent questions are answered in detail. It is comforting to infer from the background of the author that the advice found in the manual is clear and authoritive and can be relied upon by the harassed executive.

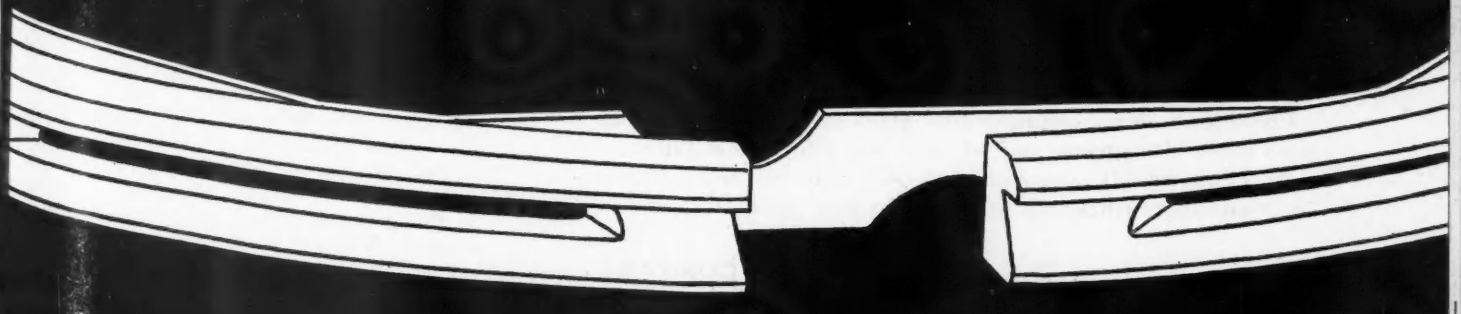


★ *Ring Leaders*

Since the earliest days of the automobile, American Hammered has consistently supplied piston rings that are a year or more ahead of the field. One American Hammered development *quadrupled* the flying time between engine overhauls in Allied war planes. Koppers Company, Inc., American Hammered Piston Ring Division, Baltimore, Maryland.

AMERICAN HAMMERED
★ *Flexible OilCutter*

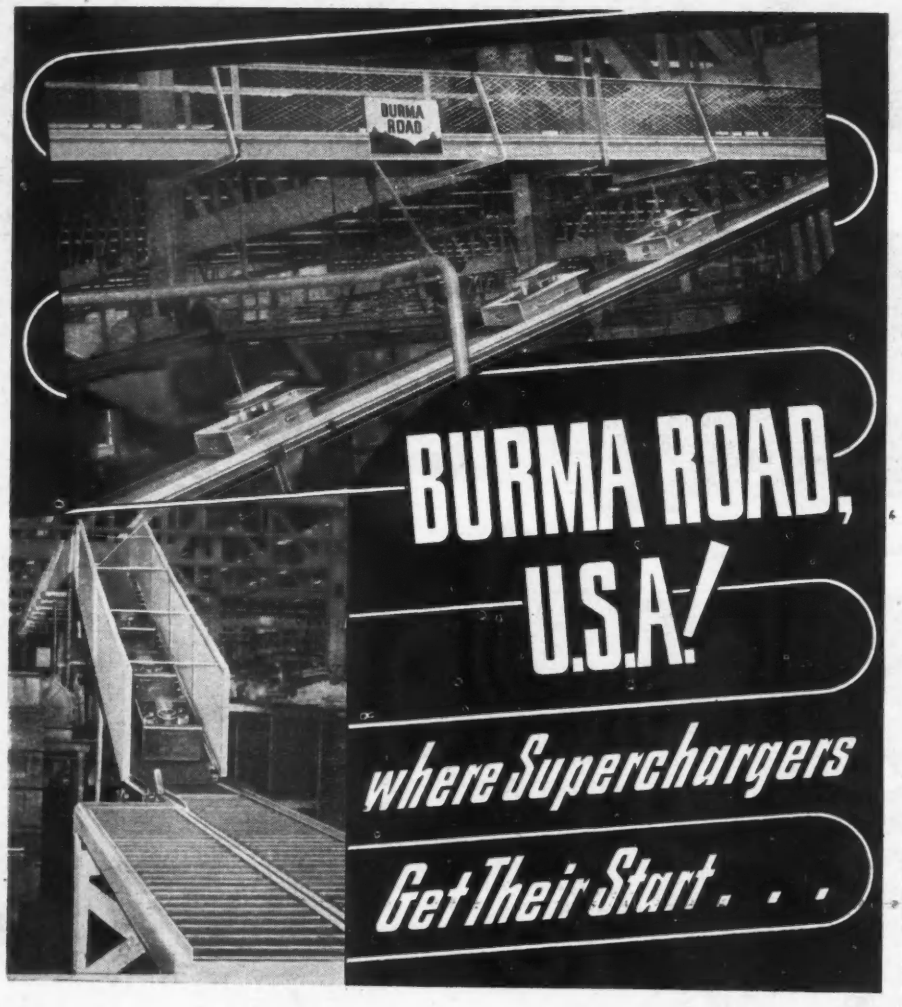
Real oil control means keeping oil out of the combustion chamber and evenly distributing it around the cylinder where it belongs. That's exactly what the FLEXIBLE OILCUTTER does! Installed with the bevel on top, the FLEXIBLE OILCUTTER rides over the oil film on the up-stroke. Then, on the down-stroke, the sharp lower edge scrapes the oil down the cylinder wall. Wide slots provide excellent drainage and freedom from clogging. The FLEXIBLE OILCUTTER adjusts itself automatically to give maximum oil control with long life—regardless of the amount of oil on the cylinder. There is a FLEXIBLE POWER Set-Up with Flexible OilCutter especially designed for every type of engine . . . tested on the Proving Grounds of global warfare.



American Hammered Piston Rings

ARMY E NAVY

A KOPPERS PRODUCT



"BURMA ROAD" is the name given by the employees in a large plant manufacturing superchargers to this conveyor system engineered by Alvey-Ferguson. Under the stimulating influence of this inspiring name, production of these vitally important aircraft parts moves forward in a steady stream!

The "Burma Road" A-F Conveyor extends from the entire manufacturing area to a large storage bank consisting of several thousand feet of A-F Roller Conveyors. All conveyors are located overhead—no valuable floor space is wasted. This A-F Conveyor System loads itself and discharges automatically . . . keeps materials and parts moving in a steady stream . . . and serves as an out-of-the-way storage bank.

Conveyor Systems, engineered by Alvey-Ferguson, enable operators to handle greater output with less effort—less fatigue—more efficiency. If you wish to move materials and products faster and more efficiently, we can help you. Write today.

ARMY E NAVY

THE ALVEY-FERGUSON COMPANY
Offices in Principal Cities
24 Disney St. Cincinnati 9, Ohio
Affiliated Corporation
The Alvey-Ferguson Company of California
P. O. Box 396, Vernon Branch, Los Angeles 11, Cal.

CONVEYING EQUIPMENT
A-F CONVEYING MACHINERY
Alvey-Ferguson
METAL PRODUCTS CLEANING & FINISHING EQUIPMENT

Studebaker Shot-Peen System

(*Continued from page* 19)

is expected to find widespread use in aircraft engine production. The combination of controlled shot-peening and lacquer treatment is said to also achieve longer life owing to increased fatigue resistance, better surface protection during assembly and at parts repair depots, and less polishing in production.

By means of the Almen technique shot-peening is held to close control in mass production, thereby assuring adequate fatigue resistance. It is claimed that the depth of surface treatment, which is the controlling factor, can be gaged to less than 0.005 in. In carrying out this check procedure, dummy rods are shot-peened every two hours. These rods contain the standard strip specimen, clamped in place and peened one one side. When released from the fixture, the strip takes the form of an arc. This curvature is then measured in an Almen Specimen Gage, which is calibrated to indicate the desired depth of the peened surface.

Separate conveyor systems and shot peening cabinets have been developed for handling the master and articulated rods. Although the basic principle is the same for both, the more complicated contours of the master rod make it necessary to provide partial treatment in individual cabinets. The shot-peening equipment consists of clusters of double-orifice nozzles arranged to aim at various angles. Metered shot is fed by gravity down one orifice while air at 100 psi pressure is forced through the other.

In production, the rods are transported on a conveyor through the cabinets, being turned by hand between cabinets to expose all sides and ends to the nozzles. During this operation, the finished surfaces such as bearing, wrist pin, and knuckle pin bores are protected by suitable plugs and fitments. It is estimated that each articulated rod is subjected to the impact of 89 pounds of 0.028 screen shot during its trip on the conveyor, while a master rod takes 450 pounds.

The process is automatically controlled at every stage. Cams attached to the peening fixture open and close the nozzles at the proper sequence. The spent shot is then automatically returned to a bin at the top of the cabinets where it is cleaned and sorted to uniform size. Following shot-peening the rods are hand washed, dried and masked, then sprayed with the lacquer.

As a by-product of this procedure, Studebaker has found that some of the final polishing and hand finished operations have been reduced, although this was not the primary motive in the introduction of this advanced technique.

the answer to greater production

LESS COST · LESS EFFORT · LESS MAN HOURS

HANSEN COUPLINGS

Hansen Push-Tite air hose couplings are "savers" on any production line. They save many steps in a day, much time and effort, and a considerable volume of air, which all adds up to greater production, less cost, and more profits. There is no shorter cut or better way to meet tomorrow's keen competition than to conserve and save all the way along the production line with Hansen Push-Tite air hose couplings. They're simple and easy to operate; slight push of plug into socket, it's connected, locked and air is automatically turned on. To disconnect, merely slide sleeve back with thumb, plug is ejected and air is automatically turned off instantly. No loss of time, air or effort, no twisting or turning to connect or disconnect.

You can't afford to be without Hansen couplings because they pay for themselves on savings and increased production.

There's a Hansen coupling made for air, oil, grease, gasoline, oxygen, and acetylene.

Our free industrial catalog is yours for the asking . . . send for it today.

Buy a War Bond and Keep It!

THE HANSEN MFG. CO.

1786 EAST 27th STREET
CLEVELAND 14, OHIO

Pour

YOUR STORAGE AND SHIPPING WRAPPERS

NOX-RUST PEEL FILM

SIMPLY DIP

THE PLASTIC PACKAGE

metal parts in NOX-RUST PEEL FILM. Dries quickly into a rubbery, plastic coating. Moisture can't penetrate. And cushiony PEEL FILM wards off damage from banging or scratching. Full protection.

PEEL FILM STRIPS OFF

The metal product emerges bright and shiny as the day it was immersed in PEEL FILM—free of rust; free of nicks or scratches.

PEEL NOX-RUST FILM

The Master RUST PREVENTIVE

NOX-RUST is available in many forms for varying requirements. PEEL FILM is the newest sensation in the big NOX-RUST family. Send today for a

Free Sample

NOX-RUST Corporation

2457 S. HALSTED ST.
CHICAGO 8, ILL.

Ford Super Deluxe and Truck Features

(*Continued from page* 27)

bar at the rear, the front stabilizer bar being continued. Synthetic rubber has been adopted for the engine mounts and several other chassis rubber parts. The chief styling change is the front end appearance with a new grille of massive design. It is made of steel stampings and chromium plated. Other changes include the hood ornament, rear deck ornamentation, hub caps, instrument panel, steering wheel, and interior trim.

Ford has announced two commercial truck lines in production—commercial car Model 59C on 114 in. wheelbase and the 1½-ton Model 59T which is offered in 134 in. and 158 in. wheelbase. The 1½-ton model comes with 7.50 x 20 tires and dual wheels at the rear as standard equipment. The two-speed rear axle is optional equipment with vacuum-operated shift controls and with 8.25 x 20 on the dual rear wheels. Both the commercial car and 1½-ton models are equipped with the 100 hp engine, which has the improvements listed above, the four-ring pistons being continued on the truck engine from the prewar design. In addition all 1½-ton truck engines have a new split-type oil pan which permits clutch replacement without removal of the oil pan.

Fairbanks-Morse Engine

(*Continued from page* 26)

This permits scavenging air to continue to enter and fill the cylinder with supercharged air at almost the scavenging air pressure. The turbulence persists throughout the injection period and is very beneficial in mixing the air and the fuel.

Because of the lead of the lower crankshaft, it receives about 72 per cent of the total power developed in the cylinder. The remaining power is delivered to the upper shaft where it is partially absorbed in driving the scavenging blower. This leaves only a relatively small amount of power to be transmitted through the vertical gear drive to the lower crankshaft which is connected to the final drive.

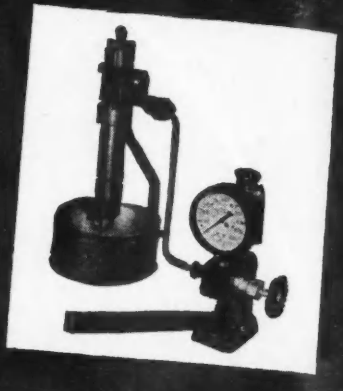
Rockford Clutch Opens Engineering Laboratories

Rockford Clutch (formerly Rockford Drilling Machine) Division, Borg-Warner Corp., announced the opening of its new engineering laboratories in the plant started almost fifty years ago and now expanded to a floor space of 625,000 sq ft. This division is producing clutches for automotive, agricultural, aircraft, industrial, marine, and machine tool fields.

ADECO

NOZZLE TESTER

Keeps Diesel Engines Running Efficiently



TESTS FUEL INJECTORS AND HYDRAULIC DEVICES At Pressures Up To 10,000 p.s.i.

To keep diesel engines operating at peak efficiency, this portable, precision-built Adeco Nozzle Tester is indispensable.

Light in weight yet built for heavy-duty service, it enables any mechanic to make quick, accurate tests on injector opening pressure, spray pattern, etc., and detect stuck needle valves and leakage around valve seats. Tests both large and small injectors, on bench or engine, at pressures up to 10,000 p.s.i. Prevents costly delays and possible damage to engine.

Ideal for testing hydraulic devices.

Write for bulletin on this practical, low-cost unit.

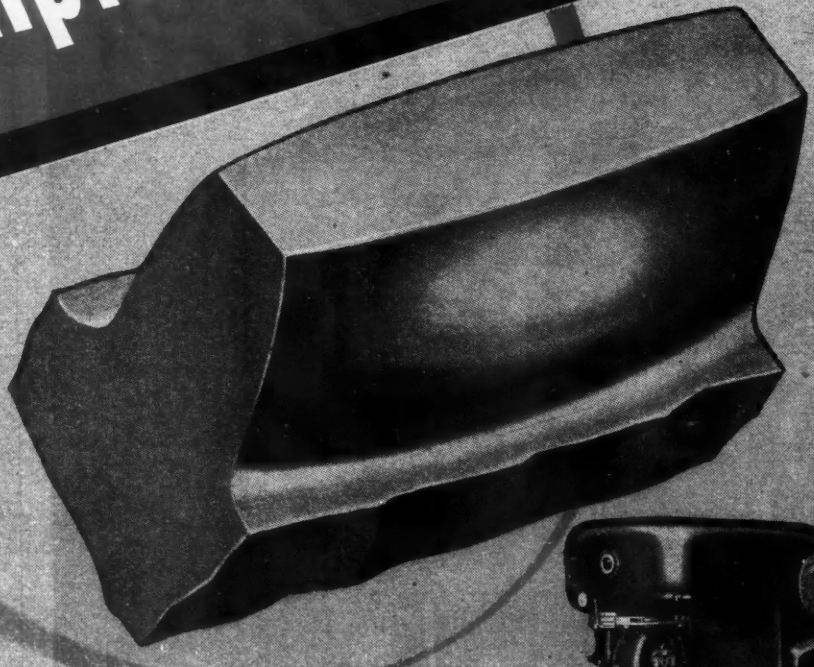
ADECO

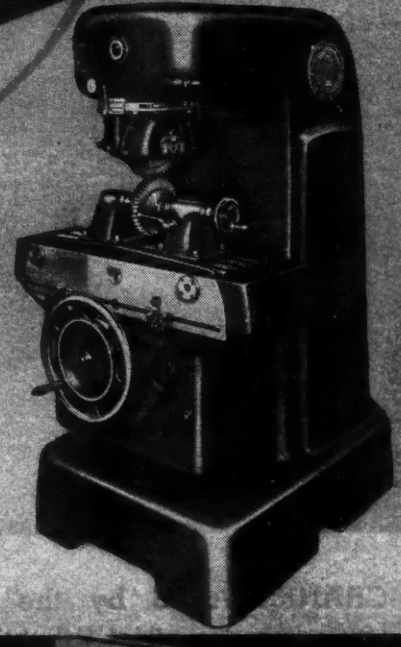
AIRCRAFT & DIESEL EQUIPMENT CORP.

4401 NO. RAVENSWOOD AVE.
CHICAGO 40, ILLINOIS

THE MOST IMPORTANT MODERN GEAR DEVELOPMENT IS THE

Elliptoid Tooth Form





The Elliptoid (crowned) gear tooth form eliminates the most important cause for gear tooth failure—"end bearing". When the gear tooth load is carried away from the ends of the tooth consistently, its full strength may be relied on. But when the load is concentrated on either end of the tooth, that gear is vulnerable.

The difference in tooth thickness between center and ends need be very little (.0003" to .0005" per inch of face), but when that difference is consistent, the gear develops maximum strength.

Red Ring Rotary Shaving Machines provide the means to give gear teeth Elliptoid Form, in addition to correcting errors in tooth spacing, helical angle, tooth profile, eccentricity and undesirable roughness.

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICH.

SPECIALISTS IN SPUR AND HELICAL INVOLUTE GEAR PRACTICE
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

Four New British Cars

(*Continued from page* 34).

ing oil to them, as well as increasing the effective bearing area.

In the rear axle of the Eight and Ten the length of the spiral bevel pinion shaft has been increased, giving wider spacing to the pre-loaded tapered roller bearings now used in place of ball bearings. Here, again, the tubular distance piece between the bearings is used as an oil trough, into which oil is carried by deflectors and galleries by the rotation of the crown bevel. Oil passing through the front bearing is trapped in a groove and led back to the interior of the axle center.

On all models the Bishop cam gear steering is used with variable ratio. On the Ten, for example, the ratio is 10 to 1 around the straight-ahead position, leading to 14 to 1 at full deflection.

Apart from the Twelve having a roomier body than the 1939 model (it is interchangeable with that of the Sixteen) there are few differences in bodywork from that of the prewar Austins of comparable types. But a new rear-end hinge for the one-piece top panel of the engine hood has been adopted. It works on the lazy-tongs principle and holds the hood open automatically when it is pushed back fully, without need for supplementary devices.

Standard's Postwar Cars

The Eight and Twelve models of the Standard line will be powered by four-cylinder L-head engines and are based upon designs that were being prepared for production just before the outbreak of the war in 1939. But numerous modifications will be embodied, notably a four-speed transmission on the Eight in place of the three-speed unit. The Twelve also is equipped with a four-speed transmission and has a 54½ in. rear wheel tread, an increase of 3½ in. The front tread remains 49 in.

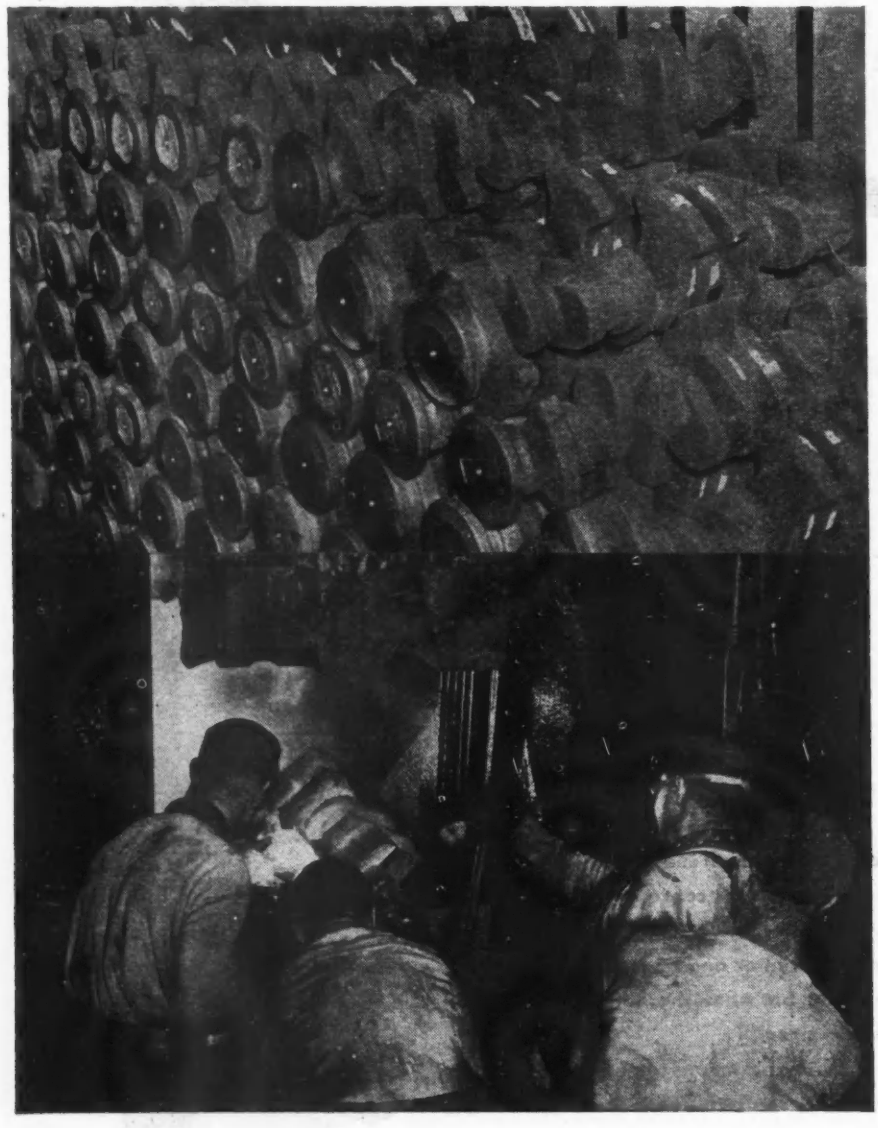
The 12 hp engine has short sleeves, or "cuffs," of a chrome-iron alloy cold-pressed into the appropriately enlarged diameter of the upper end of the cylinder bore to gain greater resistance to wear and corrosion where these are most prone to occcur. Another new feature is a steel flywheel with integral starter gear ring of which the leading edges of the teeth are flame-hardened. The hardening process is effected as follows: The flywheel is mounted on bearings with its lower half submerged in a bath of oil. Clipped to the side of the bath is a gas torch so secured as to direct the flame on to the leading edge of each tooth in turn, a registering device locating the tooth in the correct position relative to the flame. When, after very few seconds, the required temperature of the tooth is attained, the flywheel is slightly rotated and the hot tooth is thus immersed in the oil, the extent of rotation being such as to bring the next tooth into the flame.

The engine of the Twelve, with a compression ratio of 6.5 to 1 and a piston displacement of 97 cu in., develops its peak output of 44 bhp at 4000 rpm; at 2000 rpm the output is 26 bhp and at 3000 rpm 39 bhp. The maximum torque is 69 lb-ft at 2200 rpm.

The 8 hp engine has a piston displacement of 61 cu in. and with a compression ratio of 6.7 to 1 develops its peak (28 bhp) at 4000 rpm, with a maximum torque of 44 lb-ft at 2200 rpm. The Eight has a wheelbase of 83 in. and a tread of 45 in. The Eight sedan, a two-door four-passenger car, weighs 1700 lb.

On the Twelve, the 3½ in. increase of rear tread has been used to give correspondingly additional width of the rear seat, thereby making the car what is termed in England a "full five-seater" instead of a "four-five-seater." Upholstery is in unpleated leather, with a central armrest at the rear, Among other new features of the four-door sedan is a driving seat capable of adjustment as to height, angle and leg-reach, the seat by the side of

(*Turn to page* 102, *please*)



CRANKSHAFTS by the hundred thousands are forged under strict laboratory control by WYMAN-GORDON . . . all types . . . all sizes.

WYMAN-GORDON
WORCESTER • MASSACHUSETTS
HARVEY, ILLINOIS DETROIT, MICHIGAN

1. Tape holds subassembly parts together — in position for quick final assembly. Saves a lot of valuable man-hours.
2. Tape protects against moisture, dust, corrosion — and colored or printed tapes provide instant identification as well.
3. Tape prevents the chipping of plexiglass during drilling operations. FILMONIZE transparency is an added advantage.
4. FILMONIZE marks defects on castings in bright, easy-to-see colors that can't be smeared or rubbed off.

Tape up all your troubles

More and more factory bosses are saving time, cutting costs—by taping up those *!!:?x*! production bottlenecks with FILMONIZE Self-Sealing Tapes. Are you wise to FILMONIZE?

It's the tape with no "curl back"—no tangle—no waste. It's the tape that *stands up*—on or off the roll—under conditions that lots of tapes just can't take.

Ask your distributor about FILMONIZE. Let him tell you the hundred-and-one different uses for it. See the whole FILMONIZE line: Transparent Tapes, Colored and Multi-Colored Tapes, Printed Tapes, Riveting Tapes, Identifying Tapes, Splicing Tapes, Acetate Fibre Tapes, Metal Tapes, Specialty Tapes, Packaging Tapes. All in widths of ½" to 18".

P. S.—*If yours is an unusual problem, we'll put a tape engineer right on it. Just drop us a line.*

Filmonize
REG. U. S. PAT. OFF.
SELF-SEALING TAPES

INTERNATIONAL PLASTIC CORPORATION
Morristown New Jersey

the driver's being adjustable for leg-reach only. Besides the sedan in each case, a cabriolet will be offered, and on the Eight chassis a four-passenger open body with folding fabric top.

Later on an entirely new model designed expressly for export will be produced by Standard. The only information is that it will have a 15 hp engine, chassis and bodywork of "unique design" with extensive use of aluminum and embodying "a great deal of aircraft practice," a new system of remote gear control and a body seating 5-6.

British Production Set at 200,000 Cars

(Cable from London)

In a preliminary announcement June 11, Government and manufacturers agreed on a total production program covering 200,000 passenger cars for the next 12 months. Half of these will be for export. The goal for this year is 40,000, but there is no Government guarantee that materials and labor will be forthcoming. Deliveries for the next few months will be very limited and all will go to high priority buyers licensed by the Ministry of Transport. Prices probably will be 70 to 100 per cent above 1939 prices, including purchase tax.

Three more of Britain's aircraft plants are to be taken over under lease from the government for the production of cars, trucks, and automotive equipment. Two of them, hitherto known as No. 1 and No. 2 aircraft engine factories, have been operated on behalf of the Ministry of Aircraft Production by the Rootes Combine (Hillman, Humber and Sunbeam-Talbot cars and Commer and Karrier trucks). The third has been operated for the government by the Nuffield Organization, whose peacetime products are Morris, Wolseley, Riley and M.G. cars and Morris-Commercial trucks. Both Rootes and the Nuffield Organization will take over the plants for the operation of which they have been responsible during the war.

Rootes intends to expend £3,000,000 in re-equipping the two plants, one in and the other quite near Coventry. The Nuffield Organization will use its plant after large capital expenditure for the manufacture of engineering products mainly though not wholly associated with the automobile industry, though much of the plant's capacity will be devoted to the increased export activities of the organization.

Other government aircraft and aircraft engine plants about which similar announcements have been made are at Coventry to be leased to the Standard Motor Co., another between Coventry and Birmingham which the Rover Motor Co. will acquire and the Rootes-operated plant near Liverpool to be leased to the Dunlop Rubber Co. To increase its postwar production of passenger cars and trucks, the Austin Motor Co. plans to expend £1,000,000 on constructional work and production equipment at their plant near Birmingham, despite its great increase in size and capacity effected during the war.

Sir Roy Fedden, responsible until 1943 for design and development of Bristol single sleeve valve radial aircraft engines, lately technical adviser to the Ministry of Aircraft Production, authorizes announcement he and associates will produce a low-priced, six-passenger, 12-hp car with three-cylinder, radial, aircooled, sleeve valve, rear engine, full hydraulic transmission, one pedal control, independent four-wheel suspension.

GE Research Laboratory

A new building for the General Electric Company's research laboratory, which will afford some 50 per cent more space than present facilities provide, will be erected near Schenectady at a cost of $8 million. Construction will begin as soon as WPB approval can be obtained.

The site has been a private estate known as "The Knolls," and includes 219 acres. It is in suburban Niskayuna, about 4½ miles from the main plant and offices in Schenectady.

A SINGLE
CENTRAL ALL-SIZE HOSECLAMP

FITS OVER 100 DIFFERENT HOSE SIZES

● The Wolverine of the North Woods is a little fellow, but he can whip almost any size animal. The *Central ALL-SIZE Hose Clamp* likewise is able to take on any size—for just *one size* in the *ALL-SIZE* fits over a hundred different hose sizes. (The standard length, for example, fits any hose from 1" to 3" O.D.)

Thus the *ALL-SIZE* eliminates the need for different size hose clamps. And it is powerful enough for all production and service requirements. It is easiest to use in hard-to-get-at-places; has fastest clamping action; goes on or off in a jiffy, without disconnecting the hose line; has plenty of take-up, even on synthetic hose; is rustproof, leakproof, self-locking; can't strip or loosen . . . standard for U. S. combat vehicles.

SEND FOR FREE SAMPLE
No. 45-6A

CENTRAL EQUIPMENT CO. 900 S. WABASH AVE. CHICAGO 5, ILLINOIS

GET THE LATEST DATA

On U. H. F. Cables and Connectors!

Prepared by
AMPHENOL'S
Expert Staff of Research, Electrical and Plastic Engineers

Complete data is available on Amphenol's cables for the latest requirements—incorporating the solid, flexible, low-loss, mechanically stable, thermoplastic polyethylene.

Explanatory charts and technical information given on Amphenol precision-engineered manufacturing methods. The information contained in the new catalog Section "D" has been compiled thru the close cooperation of Amphenol Engineers, Army-Navy Engineers and large industrial concerns.

This explains why Amphenol U.H.F. Cables embody the same built-in quality, perfection and performance that typify every Amphenol-Engineered product.

For quick reference there is also included a complete chart listing Amphenol cable sizes, characteristics and dimensions as approved by Government Agencies.

Send today for your copy of Section "D" High Frequency Cables and Connectors. Use the coupon!

AMERICAN PHENOLIC CORPORATION
Chicago 50, Illinois
In Canada: Amphenol Limited • Toronto
U.H.F. Cables and Connectors—Radio Parts—Plastics for Electronics and Industry—Conduit—Connectors—A.N. and British—Fittings—Cable Assemblies

Please send a copy of the new catalog Section "D"

*Name*_____

*Company*_____

*Address*_____

*Also send information on*_____

Why THESE THREE PREFER G-E

Users of fluorescent, lighting engineers and maintenance men are enjoying more efficient lighting by using G-E Watch Dog Fluorescent Starters. These manual reset starters have provided the utmost in all-around fluorescent lighting service in war factories all over the nation. That's why these three prefer G-E.

1 *Users*—are more satisfied with lighting fixtures equipped with G-E Watch Dog Starters because they banish annoying blink of dying lamps once and for all.

2 *Lighting Engineers*—specify G-E Watch Dog Starters because of their unusually long life. The Watch Dog outlasts five ordinary starters.

3 *Maintenance Men*—like G-E Watch Dogs because they simplify lighting maintenance to the easy job of pushing a reset button before relamping. Reset it...forget it.

For additional information write to Section G653-103, Appliance and Merchandise Dept., General Electric Company, Bridgeport, Connecticut.

BUY WAR BONDS AND KEEP THEM

GENERAL ELECTRIC

Air Passenger Traffic Expectations

(*Continued from page* 18)

abroad should have gained momentum and the airlines should quickly obtain a large share of the first-class and cabin travel, and some of the second class.

Returning to airline operations in the United States, it is probable that existing airlines, with the approval of the Civil Aeronautics Board, will expand their route mileage substantially above the present 60,000 miles of certificated routes and will very substantially increase the number of cities served by such routes. They will also provide local services as well as increase the number of non-stop services.

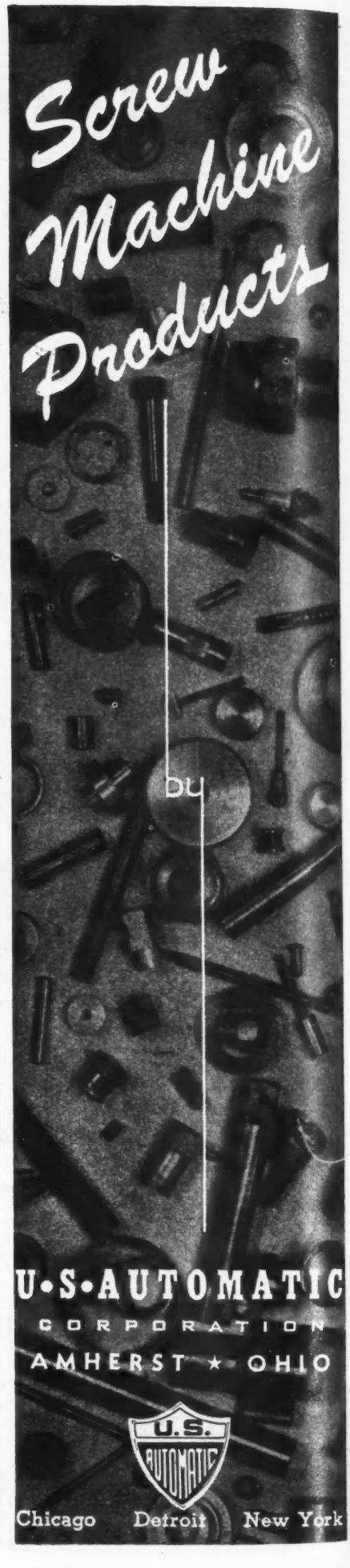
Larger and faster planes will appear in increasing number; the recent standardization in terms of DC-3's will disappear; four-engined DC-4's, DC-'6s, DC-7's and Constellations will take over the more heavily traveled routes, and will become vastly more familiar at the airports of the country. New York and Chicago should be a little over two hours apart, and the same time interval should separate Chicago and Washington, D. C.; six to seven hours should suffice for a journey from Chicago to the Pacific Coast. Flights will be more frequent, service safer and more dependable.

With larger planes, the direct operating costs per passenger-mile should decline moderately in this period, even with lower rates of utilization of planes and with smaller load factors. Some of the so-called overhead costs; i. e., those resulting from traffic activities and the indispensable general office management, may also decline in terms of actual passenger-miles of service rendered. Accordingly, some reduction in the passenger-mile cost of air transport to the patron is expectable, especially on the trunk-line routes. A rate of 4c a passenger-mile is clearly expectable, as compared with the present five cents per mile. Should so-called feeder or local routes be placed in operation, their rates will presumably be higher, even with fairly generous mail subsidies thrown in to support such routes.

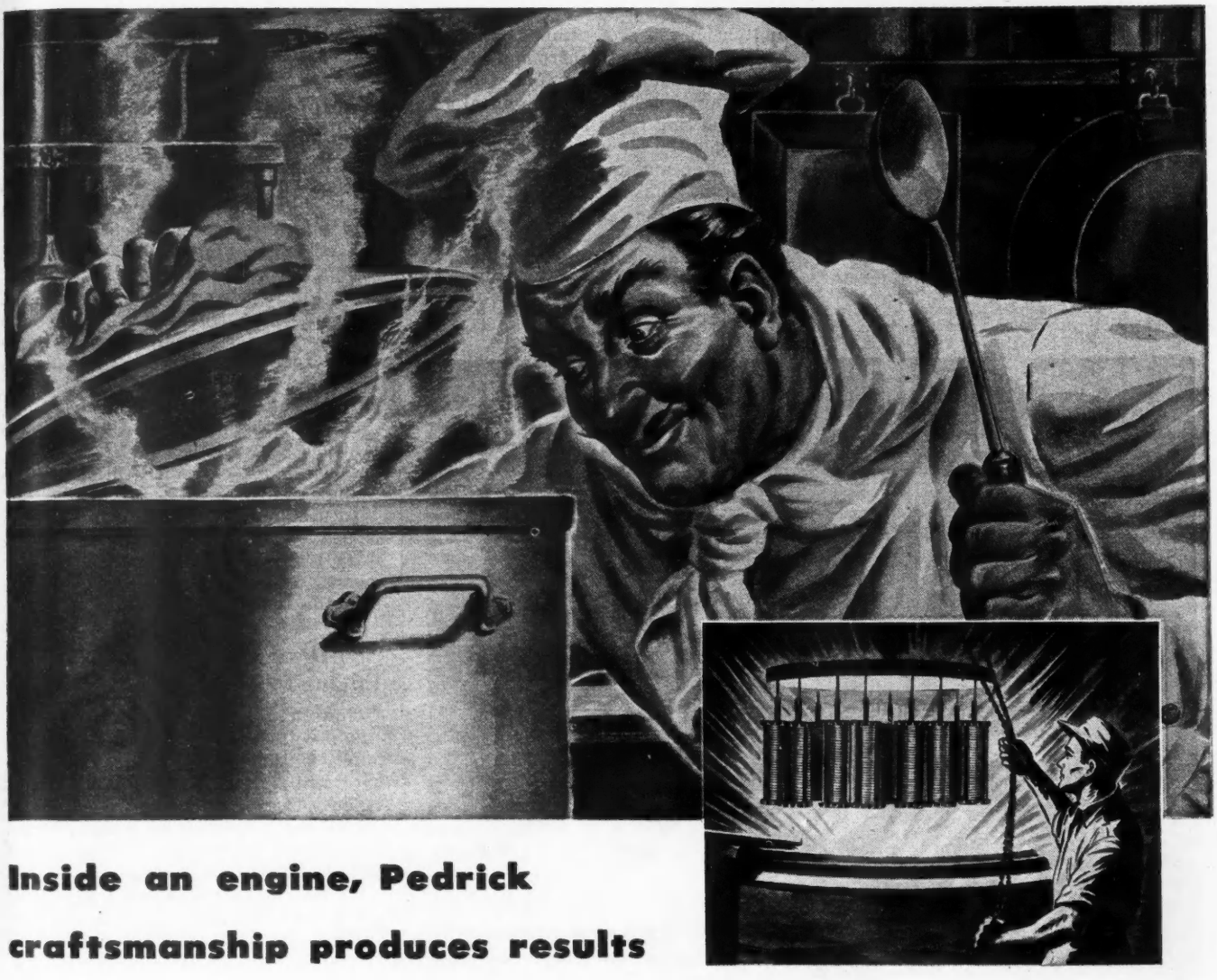
Jessop Steel Opens Export Division

The Jessop Export Sales Corp., wholly owned subsidiary of the Jessop Steel Company, Washington, Pa., has been incorporated under the laws of Delaware to handle their export sales and also to act as importing agent.

Robert A. Parks, for the past several years Jessop's representative in Washington, D. C., will be general manager of the export company. Temporary offices have been established in the Bessemer Building, Pittsburgh. Later the headquarters will be moved to New York.



It's what goes on INSIDE *that counts*



Inside an engine, Pedrick craftsmanship produces results

ALL THE THINGS that go to make up fine ring performance are properly blended into Pedrick rings. Long years of production experience in developing means of holding tolerances and tensions . . . constant field checking to be sure of results . . . advance designing to keep abreast of modern developments—all these are part of the Pedrick recipe that enables Pedrick craftsmen to produce outstanding rings.

Heat-Shaping is a typical Pedrick development that sets exactly the right amount of tension in a ring, properly distributed around its entire circumference. This exclusive process removes the stresses and strains of machining operations and greatly contributes to the long-life efficiency of the ring.

If you have a taste for better performance and longer engine life, try Pedrick rings either for original equipment or in Engineered Sets for servicing out in the field. They lengthen time between overhauls. WILKENING MANUFACTURING CO., Philadelphia 42, Pa. *In Canada:* Wilkening Manufacturing Co. (Canada), Ltd., Toronto.

Pedrick

precisioneered **PISTON RINGS**

FOR THE PRESENT, BUY MORE BONDS FOR YOUR FUTURE

Products for Aircraft

(*Continued from page* 76)

1685-H, HR, HA, HAA, HAR and HB aircraft carburetors.

The unit is a comparator built into a hinged luggage case. In the lid of the case is a set of operating instructions and an instrument panel mounting a differential gage and a vacuum gage. The lower half of the case contains a mounting table and storage space for master units. Fastened to the underside of the mounting table is an air-control manifold, an air ejector and an air vibrator. Rubber hoses conduct primary suction from the ejector to the vacuum gage and from the mounting table to the differential gage. The mounting table rests on springs so that when the air vibrator is operating, the master and test units mounted on it will be shaken in a simulation of engine vibration.

A suction relief valve is provided to limit the maximum suction produced by the air ejector. Supplied with each Holley Portable Test Unit are two auto-lean positioner clips used to locate the manual mixture controls of the master unit and the test unit in the automatic lean position during that part of the calibration check.

UPHOLDING QUALITY
SINCE 1906
ATLAS
DROP FORGINGS
SINEWS OF WAR AND PEACE
These Atlas steel Drop Forgings have taken their places in Airplanes, Tanks and Trucks—all of them America's newest, fastest and most powerful War equipment. Atlas Drop Forgings for Peace, just as potent, are now being discussed with Post-War Industry.
ATLAS
DROP FORGINGS
ATLAS DROP FORGE COMPANY • LANSING 2 MICHIGAN

Complete Low-Tension, High-Frequency, Ignition System

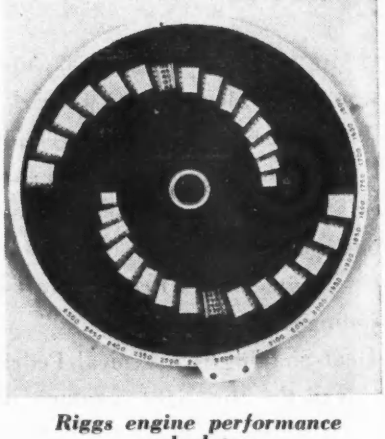
A complete low-tension, high-frequency ignition system for aircraft engines, which includes harness, magnetos and spark plugs, has been developed by AC Spark Plug Division of General Motors. The system was especially designed to improve ignition performance under adverse conditions. It is said to reduce aircraft engine maintenance time, facilitate starting in sub-zero weather, minimize the effect of oil, carbon and lead fouling of spark plugs, and solve the problem, so far as the ignition system is concerned, of raising the ceiling of extremely high altitude flying.

In use, low voltage from the magneto is delivered to the spark plugs where it is transformed to high voltage by means of a small transformer built into the top end of the plug.

New Device Calculates Engine Performance

The Riggs engine performance calculator is a simple, compact computer suitable for use in connection with Pratt & Whitney R-1830 engines. It comprises five plastic discs, all of which are joined at a common center. The overall diameter of the largest disc is approximately eight in.

Two series of slotted openings spiral out from near the center of the face or first disc, and through these slots (from figures on the third disc) brake



Riggs engine performance calculator

horsepower and brake mean effective pressure may be read. Readings for various altitudes are given at 4000-ft. intervals alongside each slot, and the lower series of spiraling slots have manifold pressure figures in inches of mercury (from 26 in. to 40 in.) printed at the base of each opening.

Figures denoting rpm are given

(*Turn to page* 108, *please*)

Long radiators equip 4-wheel drive tractors made by Federal Motor Truck Company and used to transport men and materiel on all war fronts.

Performance

It's always performance that counts . . . in war and in peace. Long radiator performance, bred in engineering skill and manufacture, has made a reputation that is world-wide for dependability and endurance. Forty-two years of painstaking research and intense specialization have given extra service and outstanding performance to Long radiators, clutches and oil coolers serving in every theater of war. Long is ready when the green light comes, to serve manufacturers of peacetime vehicles.

ARMY E NAVY

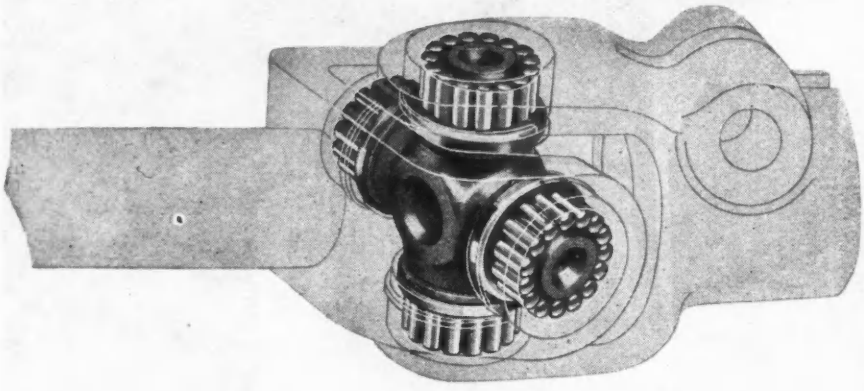
LONG MANUFACTURING DIVISION Borg-Warner Corporation

DETROIT 12, MICHIGAN • WINDSOR, ONTARIO

LONG

CLUTCHES • RADIATORS • OIL COOLERS

Bring This Important Detail of Your Tractor Up-To-Date



The higher speeds made possible by rubber tires, anti-friction bearings and good steering units have made plain bearing universal joints in your steering column *out-of-date* and inconsistant with the rest of your design. MECHANICS 1 RA Roller Bearing Steering Joints, using heat-treated alloy steels, hardened and ground to precision and factory packed with lubricant for life, provide easy, accurate and long lifed steering . . . without further lubrication. Modern design, utilizing stampings and brazing, results in a price you can afford.

Specify

MECHANICS

Roller Bearing

UNIVERSAL JOINTS

MECHANICS

MECHANICS UNIVERSAL JOINT DIVISION
Borg-Warner Corporation
2020 Harrison Avenue, Rockford, Ill. Detroit Office, 7-234 G. M. Bldg.

along the lower periphery of the third and largest disc.

The second disc has two long slots which extend radially from near its center to its edge; and these two slots are just wide enough to expose two opposite columns of figures on the face of the third disc. On the reverse side of the third disc are fuel consumption figures for both "auto lean" and "auto rich" cruising conditions.

Tabulated slots on the fourth disc enable flight engineers to select appropriate fuel consumption figures; and the tabs on the second and fourth discs are connected so that, when a given rpm and mp is shown on the forward face of the calculator, appropriate fuel consumption figures will be indicated by the fourth disc.

The fifth disc is a convential navigational computer, positioned over the center portion of the fourth disc, and it may be used as a circular slide rule as well as a density altitude computer.

The Riggs engine performance calculator was developed by Consolidated Vultee Aircraft Corp., and is being produced under license by G. Felsenthal & Sons, Chicago, Ill.

British Aircraft in Export Markets

The Society of British Aircraft Constructors, the representative body of the British aircraft industry, is organizing an export section, with headquarters in London and branch offices in the main business centers abroad. As a start, oversea offices will be opened in Latin America, India, the Far East, Middle East and the Dominions. "Trade Ambassadors" will be sent to each center to give information about British civil aircraft production and generally to encourage users to buy British machines. The cost of the new organization will be borne by the industry. The scheme has the approval of the government and the society has been assured of the help and cooperation of the appropriate government departments. It will work closely with the British air attache in each area and with the representatives of the Department of Overseas Trade.

OPPORTUNITIES IN RESEARCH

Unusual postwar opportunities will be available at Battelle Memorial Institute for qualified research men now in the services or engaged in war research.

This endowed industrial and scientific research institution will add a selected number of competent scientists to its staff just as rapidly as they can leave their present war responsibilities. The men chosen will be given every opportunity to develop in their professional fields and to apply their scientific knowledge to the solution of industrial problems.

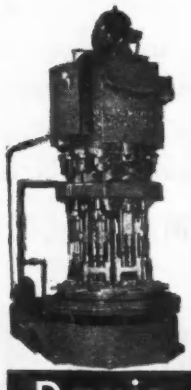
Such men will find modern scientific tools available for their use in the well-equipped Battelle laboratories, and they will be aided by a comprehensive program of fundamental research designed to expand their knowledge and their ability. Battelle operates in an unusual atmosphere which has a strong appeal to the professional research man.

Opportunities for further education, technical growth, and administrative responsibility exist.

Experienced research men in the fields of chemistry, chemical engineering, electrochemistry, physics, metallurgy, fuels, light metals, plastics, ceramics, mechanical engineering, design and product engineering, electrical engineering, applied mechanics, mining, raw materials, and allied technical professions will be considered.

Whatever your postwar plans may be, inquire now about these opportunities at Battelle. Write to:

Battelle Memorial Institute
Columbus 1, Ohio



Vertical ROTO-MATICS

Multiple spindle drill heads and automatic clamping provide added production.

DAVIS and Roto-Matic THOMPSON

Continuous operation is essential for maximum production. VERTICAL ROTO-MATICS are continuous operating, multiple spindle, non-indexing machines that are adaptable to a wide range of machine problems. . . . *Bulletins 110 and 120* may help you solve your problems. Write for them.

Davis and Thompson Co.
Mfrs. of Machine Tools and Micrometers
6411 W. Burnham St. Milwaukee 14, Wisconsin

hi-shear RIVETS

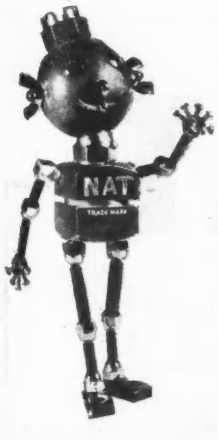
TRADE MARK

MADE BY NATIONAL SCREW

CUT PLANE WEIGHT
INCREASE SHEAR STRENGTH

The "Hi-Shear" Rivet consists of a specially formed, heat-treated alloy steel stud with a head on one end and a groove at the other end in which an aluminum collar is engaged by deforming. The riveting tool forms the aluminum collar into a high button head and shears off any excess metal.

When it is desired to repair or take apart any parts fastened with "Hi-Shear" Rivets, it is very easy to destroy the collar and push the rivet out of place without damaging the assembly.



The new "Hi-Shear" Rivet, adopted by several leading aircraft manufacturers, has a shear strength of 75,000 p.s.i. or three times that of the standard aluminum rivet.

When used to replace bolts and nuts, "Hi-Shears" effect a considerable saving of weight in the structure. This method also has an application advantage over that of applying a bolt and nut and then locking the nut by some means.

We manufacture and sell "Hi-Shear" Rivets in a full range of sizes (NAS Standards) under U.S. Patents 2,355,579 and 2,355,580 dated August 8, 1944 and Design Patent 138,579 dated August 22, 1944. Please send us your inquiries.

ADMA

National
HEADED AND THREADED
PRODUCTS

THE NATIONAL SCREW & MFG. CO., CLEVELAND 4, O.

STERLING ALUMINUM PERMANENT MOLD CASTINGS FOR ALL INDUSTRY

Sterling has for years produced fine pistons by using a unique and proven, patented molding process, fine quality materials, and unsurpassed skill in workmanship.

In addition to our piston factory, we are just completing a very modern foundry that will produce all types of aluminum permanent mold castings.

Our staff of engineers will be glad to assist you with your engineering problems. Their experience may be valuable to you.

STERLING ALUMINUM PRODUCTS Inc., St. Louis 6, Mo.

Cast Crankshafts

(*Continued from page* 30)

molding practice, in the making of cores, control of melting and pouring, and controlled cooling. Molding practice is based upon the development of special gating and risering design which has been found effective in the proper distribution of metal in large, but slender molds. Core practice is distinguished from ordinary methods owing to the special requirements of the process. Cores are precision made so as to produce the desired fidelity of dimensions and alignment, they must have resistance to penetration of heavy masses of hot metal, they must possess hot strength.

Melting practice is subject to scientific control. Proferal is produced by cold melting in two Lectromelt furnaces—one, a 4½-ton top charging unit, the other a 3-ton unit. Each heat is controlled as to chemistry by wet chemical methods and by spectography. Furnace atmosphere has a marked effect upon the end results and is inspected visually. Fluidity, surface tension, and pouring temperature of the alloy all are subject to rigid control. Fluidity is determined by a special testing procedure with the use of test specimens of unique design. Finally, it is a part of foundry practice to maintain a record of the history of each heat and each crankshaft. To this end, each crankshaft is made with an integral test bar which is cut off, subjected to tests by the metallurgical department, and the record placed in the file.

It has been found that the development of maximum physical properties and hardness is a function of controlled cooling while in the mold. For each type of crankshaft, therefore, the initial research studies also determine the specified cooling cycle and each mold is cooled accordingly before going to the shakeout.

With this commentary on development and techniques, let us consider the physical aspects of foundry procedure. Cores are bench made, using core sand prepared and controlled under

(*Turn to page* 112, *please*)

DANLY PRECISION DOWEL PINS

STANDARD AND .001 OVERSIZE

Hardened and Precision ground to a tolerance of ±.0001 of an inch. Available in .001 oversize for repair or renewal work.

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue • Chicago 50, Illinois

Milwaukee..111 E. Wisconsin
Detroit...1549 Temple Ave.
Cleveland..1550 E. 33rd St.
Dayton....990 E. Monument
Rochester..16 Commercial St.
Philadelphia,3858 Pulaski Av.
Long Island City 47-28 37th St.
Ducommun Metals & Supply
4890 S. Alameda, Los Angeles

FELT

We make FELT to close standards for thousands of uses. War demands and technological advances are regularly developing new applications. We can help you.

American Felt Company

TRADE MARK

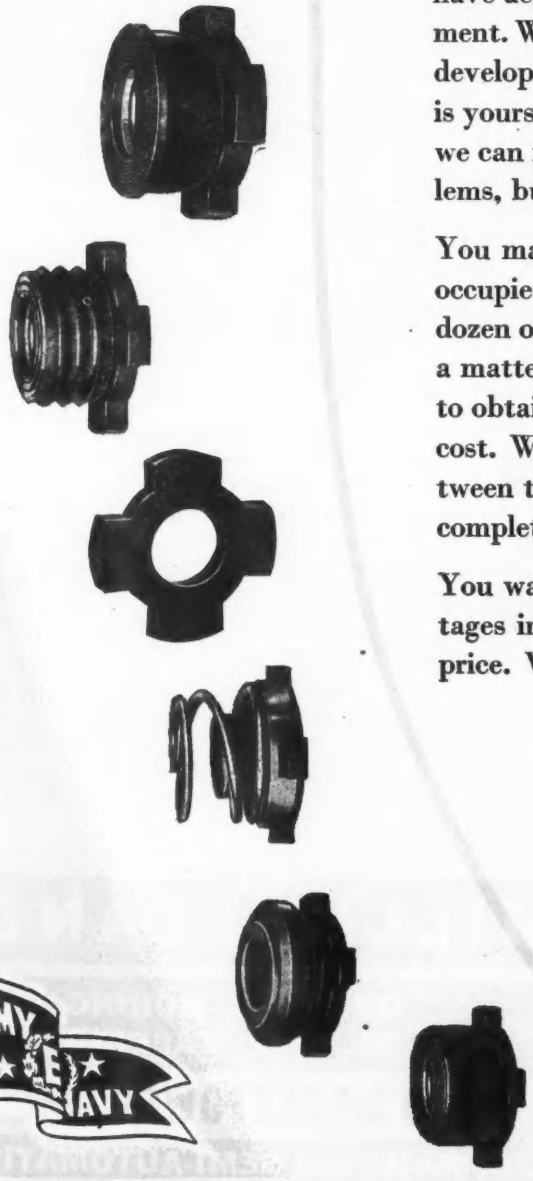
General Offices: GLENVILLE, CONN.

New York Boston Chicago Detroit Philadelphia St. Louis
Cleveland Los Angeles San Francisco Dallas Seattle

A complete WATER PUMP *service*
FOR YOUR NEW PRODUCT....
FOR IMPROVING PRESENT MODELS

THE MARK OF MERIT
AQUA-TITE

Automatic
SHAFT SEALS
for All Requirements
AUTOMOTIVE
***and* STATIONARY**



ARMY-NAVY "E"

Manufactured by

THE MARK OF MERIT
AQUA-TITE

Schwitzer-Cummins will produce a FINE SEAL—a FINE IMPELLER—or a COMPLETE PUMP for you and all at a decided advantage in the performance of your product.

We have been specialists in the design and building of water pumps since the pioneering days of the automotive industry, and have actively participated in every era of the industry's development. We are the originators of the Automatic Shaft Seal and have developed it to its present stage of perfection. This long experience is yours for the asking. We invite your inquiries in the belief that we can not only be of assistance to you in your engineering problems, but can save you money as well.

You may want more water. You may have to reduce the space occupied by the pump. You may have a persistent leakage, or a dozen other troubles. Let us tackle the job. We will not take it as a matter of simply selling you merchandise, but as an obligation to obtain for you a highly efficient performance at a minimum of cost. We know so well the close relationship there must be between the seal, the impeller, and the pump itself if there is to be complete satisfaction.

You want either advantages in performance or price. We have both.

Send Today FOR OUR NEW CATALOG...
THE STORY OF AUTOMATIC SHAFT SEALS
A SCHWITZER-CUMMINS DEVELOPMENT

SCHWITZER-CUMMINS COMPANY
INDIANAPOLIS, INDIANA, U. S. A.

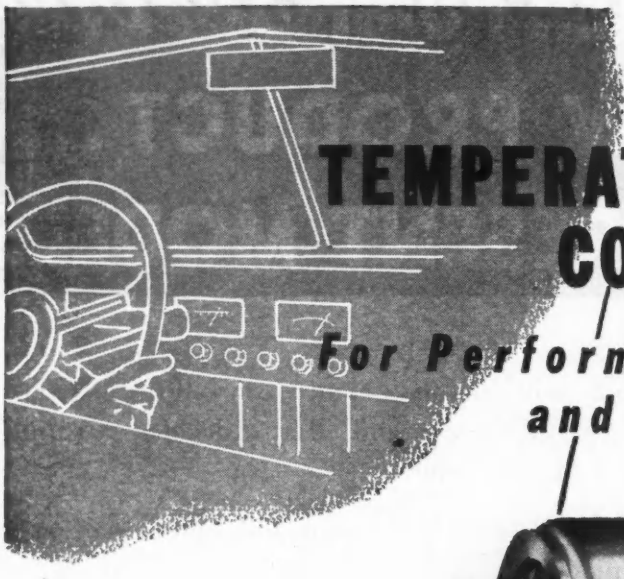
the supervision of the metallurgical department. After drying, the cores are hand finished to gages and templates to assure accuracy. The finished cores then are ready for assembly in molds.

Molding practice depends upon the size of the shaft. Small shafts are molded in jolt-squeeze type molding machines in conventional manner. Molds for large shafts are prepared with the aid of a huge sand slinger. The green molds are then finished by hand and dried in the large baking ovens. Following drying the cores are installed in the mold with meticulous care and the molds return to the drying ovens for another bake as an assembly.

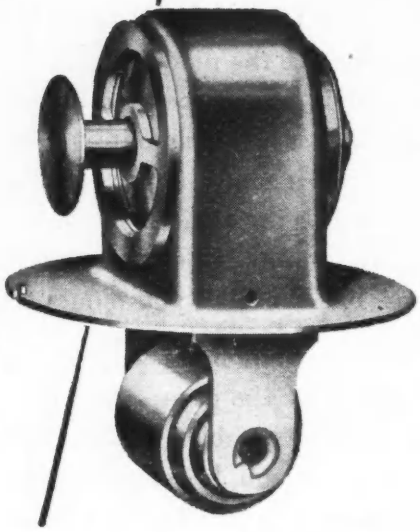
Pouring is a special technique developed by C-W-C. The large flasks, some weighing as much as five tons, are installed in a horizontal position on fixtures mounted over deep pits. The metal is poured while the flask is in this position, then the mold is rolled into a vertical position in the pit to assist in the proper distribution of hot metal in the long passages. It is held in this position for a specified length of time to assure proper cooling, then is lifted from the fixture and set aside for the cooling cycle in the mold.

For the shake-out, the foundry has been equipped with one of the largest Simplicity grates known to the art. Following shake-out the crankshafts are transported to the cleaning room for chipping and grinding. The final mechanical operation before inspection and shipping is that of shot-blasting in one of two large booths. In the final inspection—for size and visual checking of surface perfection—the cranks also are Brinell-tested for hardness.

Since this is the first foundry of its kind specializing in the production of cast crankshafts, selected views of equipment and procedures have been included in the pictorial section of this article to give the reader a better appreciation of the size and scope of the activity. Having made its contribution to the war effort, the crankshaft foundry will be in an excellent postwar position to offer its unique facilities to the manufacturers of all manner of automotive engines and large Diesel engines.



TEMPERATURE CONTROL
For Performace and Savings



Motor temperature control—with a Dole Thermostat means a quick warm-up, reduction of crank case dilution, saving of oil and gasoline. Also saves motor wear and improves performance.

Dole Poppet-type Thermostats will assure even more positive control—better performance in the finer cars of the future.

DOLE
Thermostats

THE DOLE VALVE COMPANY
1901-1941 Carroll Avenue, Chicago 12, Illinois
Los Angeles Detroit Philadelphia

B·H
Manufacturers of
Sheet Metal and Tubular Accessories
for Leading Engine and
Propeller Manufacturers
B-H AIRCRAFT CO., Inc. 27-01 Bridge Plaza, N., Long Island City, N. Y.

MILLHOLLAND
Automatic DRILLING - BORING MILLING - TAPPING Units
½ to 20 HORSEPOWER DRIVE
AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY
W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

Taming 8800 Horses OVER TOKYO

Wright Cyclone Engines ...arings of Pittsburgh Steel

Upon the *complete integrity* of the two bearing shells, in each of its four 2200 H.P. Wright Cyclone Engines, depends the success of every B-29's mission over Tokyo! This *tremendous responsibility* has been safely entrusted to bearings fabricated from Pittsburgh Seamless Steel Tubing.

The mighty, surging strength of 2200 "horses" is transmitted as dynamic power through these main bearings of tubular steel. Sustaining a take-off load of 4000 pounds per square inch, or a diving load that may reach as much as 7200 p.s.i., the flawless character of the steel required is obvious. *Pittsburgh Seamless,* for bearing back purposes, combines the requisite strength with the extraordinary cleanness necessary for the successful application of the mirror-smooth silver plating of bearing surfaces.

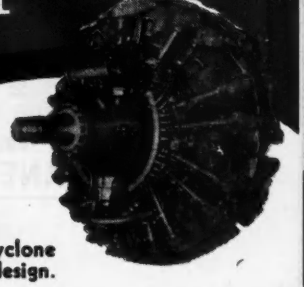
Over Tokyo, or in the less spectacular but equally exacting applications of industry, the *quality* of *Pittsburgh Seamless* can be counted on to do the job.

PITTSBURGH STEEL COMPANY
1653 Grant Building · Pittsburgh, Pa.

A typical main bearing, removed from its master rod, is shown at left. The entire horse power load from 2 sets of 9 radial cylinders is sustained by two such bearings.

PITTSBURGH SEAMLESS STEEL TUBING
CARBON, ALLOY, STAINLESS STEEL

ONLY THE BEST IN STEEL IS GOOD ENOUGH TO FLY



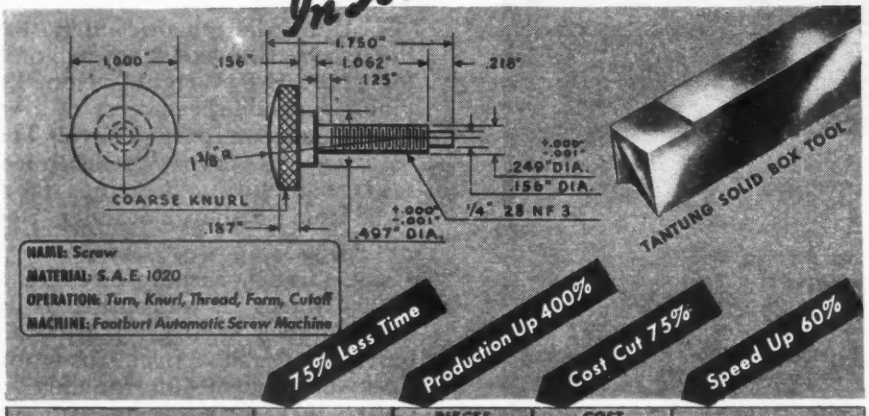
The heart of the Boeing B-29 Super-Fortress is its four 2200 H.P. Wright Cyclone 18 Engines, one of which is illustrated at right. Another famous Wright Engine, The Cyclone 9, uses a Pittsburgh steel bearing in its single radial design.

Comparative Performance showing advantages of

TANTUNG

THE MIRACLE METAL

In Screw Machine Operation



TOOLING	ACTUAL TIME	PIECES PER HOUR	COST PER 100 PIECES	SPEED R.P.M.
HIGH-SPEED STEEL	4.30	13.9	$7.17	640
TANTUNG	.95	63.2	1.58	1060

THE ABOVE TEST was made in the plant of a large aircraft manufacturer, under ordinary shop conditions. Tantung tools have demonstrated superiority over high-speed steel tools in thousands of screw machine operations.

Tantung is especially efficient in machining materials which have a tendency to gall or tear, such as stainless steel, aluminum, bronzes, non-ferrous alloys, etc.

Tantung is a hard, tough, cast alloy containing Tantalum-Columbium Carbide. It is the high red hardness of Tantung, greater than any high-speed steel, that enables it to work so efficiently. Send for the free Tantung Catalog.

VASCOLOY Ramet RAMET CORPORATION

CARBIDE TOOLS AND DIES AND TANTUNG CAST ALLOY TOOLS

NORTH CHICAGO, ILLINOIS • SALES AND SERVICE IN PRINCIPAL CITIES

4520

Curved Glass Windshields

(*Continued from page* 21)

Ray Projection Equipment

The apparatus holds a windshield of any shape in the same relative position the windshield will occupy in the aircraft. Mounted aft of and above the windshield are two high-powered projectors whose convergent rays meet on a screen or other flat surface 20 ft ahead of the glass. The windshield is moved in all directions so that one light ray passes through all portions of the glass in the same manner as the pilot's vision will penetrate it and the result is compared with the standard setup on the projected adjustable target.

In glass inspection "deviation" caused by refraction of light through any material must be separated from "distortion." The former causes any line or object viewed through glass to be slightly changed in position, but not in shape; for example, the end of a stick shoved to the bottom of a pool of water does not appear to go where it actually does. Distortion, on the other hand, will change the appearance of the outline of an object. With distortion present a straight line will appear to wave, if vision is shifted slowly from side to side. On the ray projection equipment, deviation and distortion can be separated and accurately measured in any shape of windshield.

While moving the windshield slowly across the light pattern, any distorted portion will change the screen shape either by twisting of the line, or the changing of the angle. The adjustable target will compensate for the deviation. With distortion present, the lines not only move but also take on different shapes. This is what confuses the pilot and is what we are measuring and working to eliminate. When the amount of distortion present has been measured and determined, the inspector engraves the maximum amounts present in each vision area in the corner of each windshield. This permanent record eliminates hours of controversy in the future handing of the glass.

(*Turn to page* 116, *please*)

UNIT

NEW FULL VISION CAB

mobile CRANE

SELF-PROPELLED

5 to 7 TON

Write for particulars

Powerful, fast-stepping Mobile Crane . . . one-man operated . . . for "on and off" highway operations . . . simple to operate . . . (eliminates cut-up terrain, mutilated concrete decks and runways.)

UNIT CRANE & SHOVEL CORP. MILWAUKEE 14 WISCONSIN

• POSITIONS OPEN •

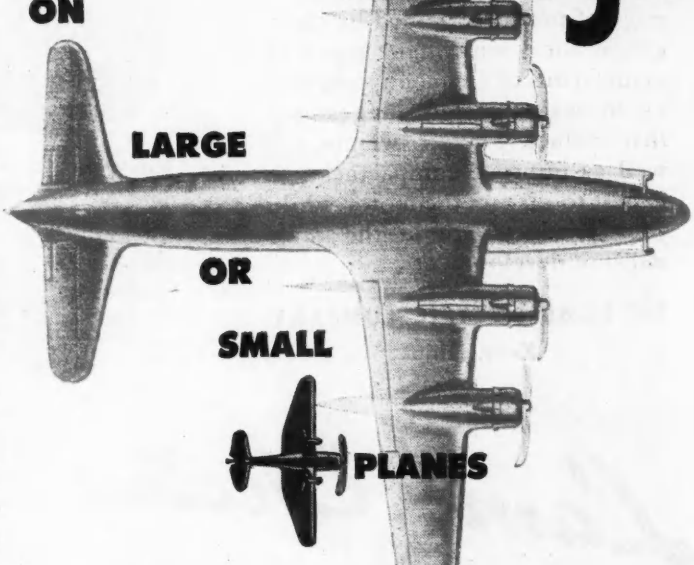
DIESEL ENGINEERS
DESIGNERS and DRAFTSMEN
FOR DEVELOPMENT WORK
ON

New High Power Engine • POST-WAR POSSIBILITIES • Eastern Location • Address Box 27; care of this Magazine

Statement of availability required.

One design

ON



LARGE

OR

SMALL

PLANES

gives maximum braking effectiveness

The inherent soundness of the *NEW BENDIX* disc brake design is demonstrated by its ability to meet the braking requirements of all types of planes.

The same principles of construction are applied to brakes ranging from 9 in. to 31 in. in diameter and the same outstanding braking results are obtained regardless of the size or type of plane.

In this new Bendix disc brake, heat absorbing elements called rotors turn with the wheel by means of keys fastened to the wheel itself. These rotors are made in sections rather than in a continuous ring which results in far greater capacity for heat absorption, eliminating fading or warping of either rotating or fixed members.

Also contributing to all around efficiency is the fact that this new design effects considerable weight reduction in wheel and brake assembly.

Thus low hydraulic displacement and greater heat absorbing capacity combine to produce maximum braking effectiveness.

Bendix

PRODUCTS DIVISION

BENDIX AVIATION CORPORATION

SOUTH BEND 20, INDIANA

Bendix* Landing Gear • Bendix Pneudraulic* Shock Struts • Bendix Airplane Wheels • Airplane Brakes • Hydraulic Master Cylinders and Power-Brake Valves make up the list of Bendix Landing Gear Equipment.

*TRADE MARK

Design Features—Fixed discs are faced with friction lining; lining is segmented in such a way as to scavenge lining dust and provide air circulation. Eliminates fading and gives greater braking force with less contact pressure.

Rotating members, keyed to the wheels, provide large heat-absorbing capacity.

Rotors are made in segments instead of a continuous ring; this allows for heat expansion without warping or cracking.

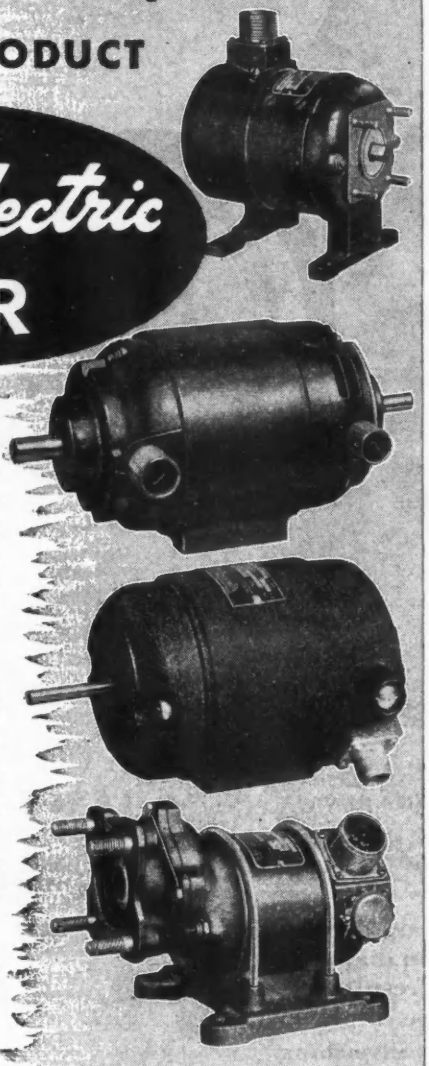
PRODUCT OF Bendix AVIATION CORPORATION

Low Weight... Compactness

for your *New* PRODUCT

WITH A

Lamb Electric MOTOR



30 YEARS' experience designing and building fractional horsepower motors for all types of special applications has taught us where and how much *motor* weight can be reduced without interfering with essential electrical characteristics. Our knowledge of products gained by close cooperation with many types of manufacturers frequently enables us to make design suggestions that reduce *product* weight, as well as improve compactness. It is best to discuss the motor while your products are in the *early stages* of development.

THE LAMB ELECTRIC COMPANY
Kent, Ohio

Lamb Electric
FORMERLY Black & Decker Electric
SPECIAL APPLICATION FRACTIONAL HORSEPOWER **MOTORS**

Excellent Optical Properties

The amount of distortion in curved windshields is not yet entirely controllable in manufacture, but without doubt our modern airplanes are equipped with curved windshields of remarkable quality that far surpasses prewar glass quality. This transition has been gradual and brought about by the exacting demands of our pilots, the high quality standards set up by the aviation industry, and the untiring efforts of the glass manufacturers to improve laminated glass. Our military and naval services have cooperated in every way to make use of the windshields that were available to them. Similarly, the manufacturers have bent their every effort toward improvement of designs. One example of this is the dividing of windshields into vision areas with varying optical requirements, which has resulted in added strength, decreased drag and greatly developed optical properties. Today, our pilots can have the assurance that the glass that protects them affords a certain standard of visibility regardless of its shape. Sometime in the near future it may be possible to produce a curved windshield entirely without distortion. However, at present, all glass except ground lens has some distortion. This distortion has to be isolated and accurately measured. Standards have to be set up for each windshield design.

Visual Inspection Tiring and Uncertain

From our study of distortion in glass and methods of measuring it, we have learned that all of us do not have proper vision for visual glass inspection and that human ability to see and differentiate the actual amounts of distortion in glass varies considerably among those of us who have normal vision. It has been established by a series of tests that there exists a critical point in the visual inspection of glass at which some persons do not detect distortion and others do. Some can see distortion more than one minute of arc below that point and with others it does

(*Turn to page* 118, *please*)

Tool Designing Engineers

BERG ENGINEERING SERVICE
DETROIT — 8718 Mack Avenue — Pl. Place 5990
CHICAGO — 166 W. Jackson Blvd. — Pl. Wabash 7087

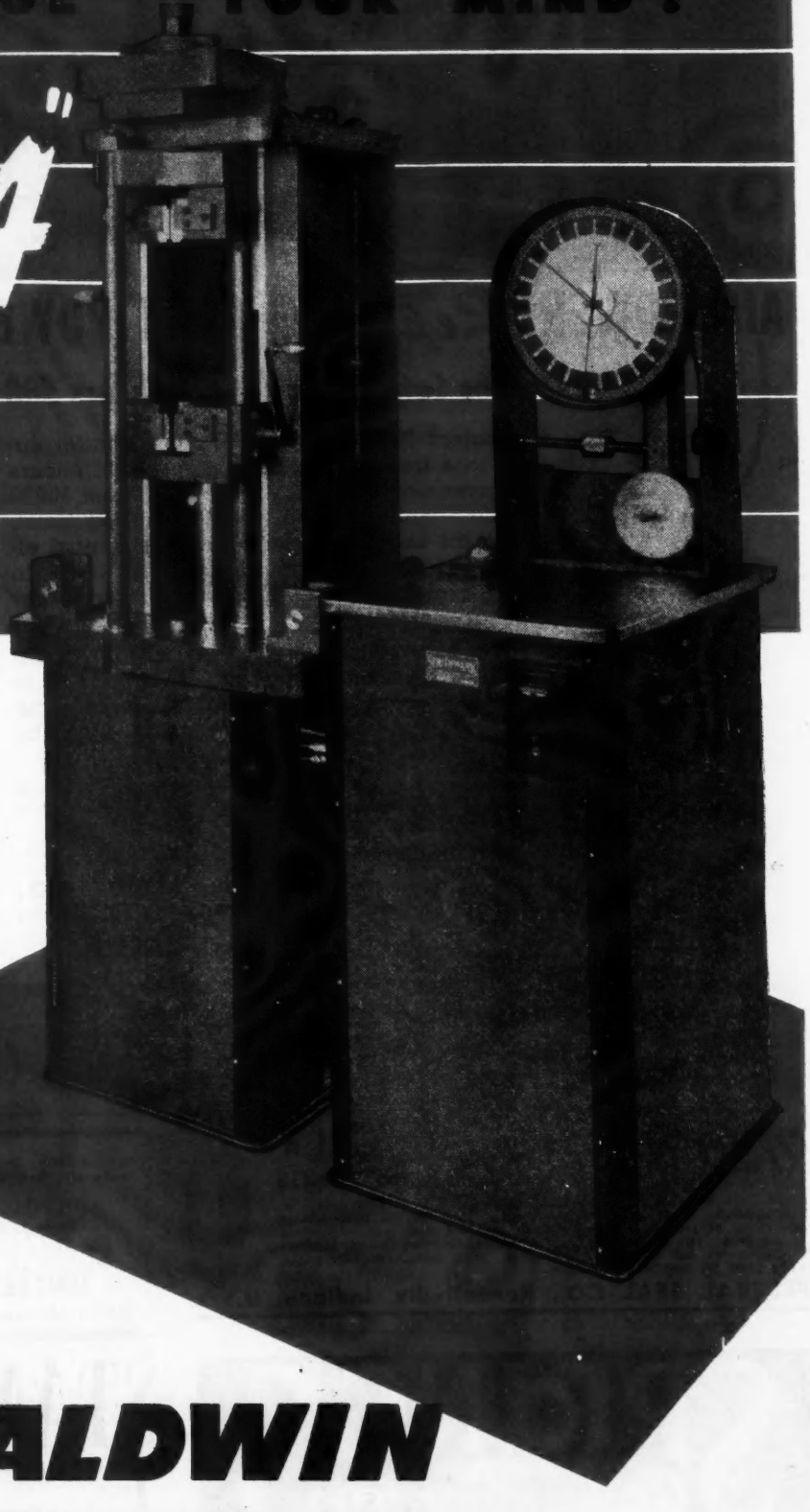
Manufacturers of a complete line of AC & DC Electric Resistance Welding Machines.
Watch page 9 next issue for our full page advertisement.
SCIAKY
4915 W. 67TH ST., CHICAGO, ILL.

STAMPINGS
Heavy, medium and light stampings in any quantity. A steady flow of production—*when* you want it.
WORCESTER STAMPED METAL CO.
9 Hunt Street, Worcester, Mass.
WORCESTER STAMPED METAL — QUALITY STAMPINGS

JOHN CRANE *Bellows*
PUMP SEAL
Designed for AIRCRAFT, MARINE, JEEP, TRUCK, TRACTOR AND AUTOMOBILE PUMPS
CRANE PACKING COMPANY, 1618 CUYLER AVE. CHICAGO 13, ILL.

IF YOU THINK YOU CAN'T AFFORD A GOOD TESTING MACHINE . . . THIS WILL CHANGE YOUR MIND!

THE NEW "S-604"



With a wealth of knowledge and experience on which to draw, Baldwin has climaxed a long standing desire to produce a low price testing machine measuring up to Baldwin standards.

The "S-604" offers so much for so little because of (1) quantity production; (2) forethought in the design stage, which eliminated expensive operations; (3) maximum use of standard parts; (4) studious attention to production detail; (5) use of structural steel framing; (6) maximum use of shop tooling; (7) manufacturing emphasis on control parts of weighing system, load control and recording

For a full description, ask for bulletin 212. The Baldwin Locomotive Works, Baldwin Southwark Division, Philadelphia 42, Pa. Offices: Philadelphia, New York, Chicago, Washington, Boston, Cleveland, St. Louis, San Francisco, Houston, Detroit, Pittsburgh.

BLW THE BALDWIN GROUP

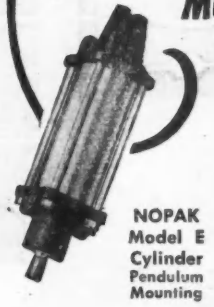
BALDWIN

TESTING EQUIPMENT

Metal Cutting Shears at Delzer Specialty Co., Milwaukee, converted from foot-treadle to air operation with NOPAK Model E Cylinder and Model R Foot Valve. Air line pressure of 80 and 100 P.S.I. is amply supplied by a 3 H.P. compressor.

AIR POWER *Replaces* FOOT POWER

Multiplies Cutting Capacity of Shears 500%



NOPAK Model E Cylinder Pendulum Mounting

A standard NOPAK Model E Air Cylinder applied to a treadle operated, sheet-metal shears has increased its cutting capacity at least 500% . . . and enables it to cut heavier gauged metal. The strain and fatigue of strenuous manual effort has been eliminated, an important factor in this instance because the operator has other duties to perform.

The cylinder is controlled by a NOPAK Model R Foot Valve, leaving operator's hands free to feed and remove the metal sheets and manipulate locking levers . . . while speeding up the cutting cycle.

NOPAK Model R Foot Valve

This simple installation of a NOPAK Valve and Cylinder suggests how manually operated machines in your plant may be converted to Air or Hydraulic Operation.

Write for NOPAK Bulletin 87.

GALLAND-HENNING MFG. CO.
2774 SOUTH 31st STREET • MILWAUKEE 7, WISCONSIN

Representatives in Principal Cities

NOPAK VALVES and CYLINDERS
DESIGNED for AIR or HYDRAULIC SERVICE

not register until the distortion has gone one or two minutes above it. No one, however, can separate "deviation" from "distortion" by visual inspection of glass.

In mechanical inspection of windshields, the glass is slowly moved in both horizontal and vertical directions, so as to simulate the view of the pilot as he turns his head to look through different parts of the windshield. This new device is a decided advantage over the visual method of inspection, during which the inspector sat behind a simulated nose section and rotated the glass horizontally in front of him, looking toward a screen or grid and watching to see if the superimposed lines move or waver. This was very fatiguing and the results of such inspection were irregular and highly unsatisfactory—and costly—due to variations in vision and other human factors.

Accurate Measurement Now Possible

It is now possible to measure accurately whether or not the apparent movement of any object seen through the windshields will change in shape in an amount greater or less than the standard formulated by any certain specifications. It is not a matter of judgment, but entirely a matter of light falling within a measured space. If outside this space, the glass will be rejected; if within, it is acceptable. In not having to locate a maze of lines for a considerable period of time as in the old method, the eyes do not become tired. The eye-strain is almost negligible. The work is no more complicated than the comparison of any bolt or machine part. By using this equipment, it is unnecessary to handle the windshield. Mounted in the position it will assume in the airplane, it is easily moved to every position at which the pilot will later observe his surroundings. Ease of inspection makes it possible to prevent defective windshields reaching the installation point. In addition, it makes possible the use of a great many windshields which heretofore have been rejected because the inspector was uncertain as to whether the windshield was satisfactory. By

(*Turn to page* 120, *please*)

New . . . ★MASTER SEAL★
SHAFT SEALING UNITS

A self contained self aligning, tamper proof, low loss, SHAFT SEAL for rotating shaft. Easily installed or replaced. Made in two styles—flange type shown or press type assembled in a pressed steel case. Adaptable for use in Aircraft Electric Motors, Oil Pumps, Gasoline Pumps, Hydraulic Equipment and accessory drive shafts. Will design for your needs. Write today for complete information.

FEDERAL SEAL CO., Kendallville, Indiana, U.S.A.

For Ignition Switch Service; Directional Switches; Dave Tells
MITCHELL DIVISION
Philadelphia, Pa.

Air Cleaners—Oil Bath and Pre-Cleaners for Engine Protection
UNITED AIR CLEANER DIV
Chicago, Ill.

Divisions of
UNITED SPECIALTIES COMPANY
9705 Cottage Grove Ave. Chicago, Ill.

SPRINGS
"Measurably Better"
Service Springs
FOR ALL CARS AND TRUCKS
SERVICE SPRING COMPANY • INDIANAPOLIS 6, INDIANA

STAMPINGS
Capacity available for high speed production of small stamped and drawn metal parts.
AMERICAN METAL WORKS, INC.
1537 GERMANTOWN AVE., PHILADELPHIA 22, PA.

The automobile dash panel, illustrated above, is another example of where the designer's ideas for use of sharp lines with substantial appearance were made production-possible by Quality Zinc Die Casting. Die Cast parts require less finishing and assembling time, thus saving man hours and cutting costs.

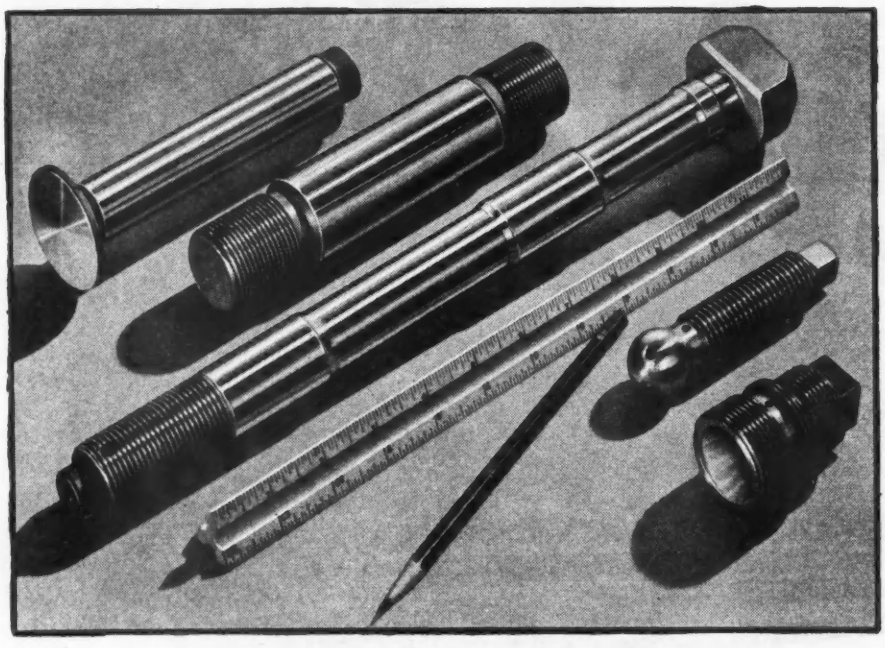
We are concentrated on war production but our Planning Department is at your disposal to aid you in setting up your plans for the future use of Die Castings.

CONTINENTAL DIE CASTING CORPORATION

SUBSIDIARY OF F. L. JACOBS CO.

9615 GRINNELL AVENUE DETROIT 13, MICHIGAN

BIG STUFF



Long years of experience have enabled The Chicago Screw Company to turn out millions of precision made screw machine products regardless of size, shape or form.

Illustrated above are a few of the larger hardened and ground screw machine products which we manufacture to exacting specifications. While we handle all types of screw machine and cold upset parts from the simplest to the most complicated, it is on the really *tough* jobs that we can demonstrate the full value of our experience, engineering ability and most modern production facilities . . . Remember "Chicago Screw" when you need close tolerance, precision made screw machine products.

ARMY E NAVY

THE CHICAGO SCREW CO.
ESTABLISHED 1872
1026 SO. HOMAN AVENUE CHICAGO 24, ILL.

the mechanical method, there is no doubt as to the acceptability of the glass if the projected ray falls within the specified space. Uniformity is assured and the pilot can know that any distortion apparent to him in the glass is not of sufficient magnitude to cause serious deflection of vision.

References

(A) SAE paper on the "Constellation" by Clarence Johnson of Lockheed, November, 1944.

(B) Technical Report TR-730.

(C) "New Windshield Developments" SAE paper A. L. Morse CAA-8 April, 1943.

Society of Industrial Designers Formed

To establish criteria for ethics, training and practice in the profession, fifteen of the nation's leading industrial designers announced jointly the formation of the Society of Industrial Designers. The officers of the society are: Walter Dorwin Teague, president; Raymond Loewy, chairman of the executive committee; Henry Dreyfuss, vice-president; Harold Van Doren, treasurer; and Egmont Aren, secretary. The other founders are Donald Deskey, Norman Bel Geddes, Lurelle V. A. Guild, Ray Patten, Joseph B. Platt, John Gordon Rideout, George Sakier, Jo Sinel, Brooks Stevens, and Russel Wright. The founders are serving as the board of directors of the society, the first organization limited in membership to professional industrial designers.

The society has a temporary office at 55 West 42nd Street, New York. Philip McConnell has been appointed executive secretary.

Berry Appointed

J. Walter Thompson Co. has appointed P. N. Berry as assistant account executive serving Ford branches and dealers. Mr. Berry, who will be a member of the agency's Detroit office, was formerly Southern Division sales manager of De Soto.

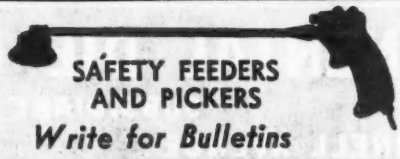
STEEL
Immediate Warehouse Shipments

COLD FINISHED BARS • AIRCRAFT STRIP STEEL • COLD ROLLED STRIP STEEL
COLD ROLLED SHIM STEEL • SHEET STEEL • ROUND EDGE FLAT WIRE
TEMPERED AND ANNEALED SPRING STEEL • ROUND WIRES
STEEL BALLS • FEELER GAUGE • DRILL ROD

GENERAL STEEL WAREHOUSE CO., INC. 1830 N. Kostner Ave. CHICAGO

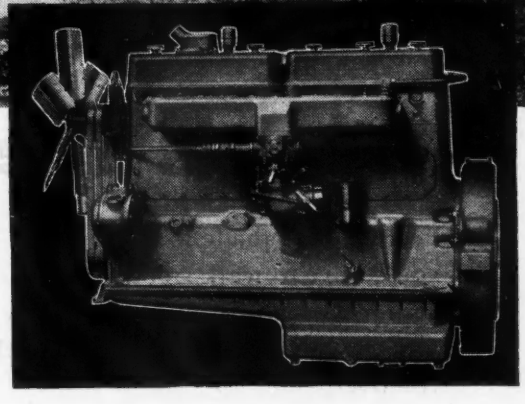
• GASKETS
• BOXES
• ENVELOPES
PAPER Pierce PRODUCTS
• PAPER TUBES AND CANS
PIERCE PAPER PRODUCTS CO.
3720 AUBURN STREET ROCKFORD, ILLINOIS

P&H HARNISCHFEGER CORPORATION
Complete Arc Welding and Materials Handling Service
AC and DC Electric Arc Welders and Electrodes, Welding Positioners, Electric Hoists and Cranes.
4559 W. National Ave., Milwaukee 14, Wis.
ARC WELDERS • EXCAVATORS • ELECTRIC CRANES P&H MOTORS • HOISTS • WELDING ELECTRODES



SAFETY FEEDERS AND PICKERS
Write for Bulletins
REELS FEEDS STRAIGHTENERS
F. J. LITTELL MACHINE CO. 4155 Ravenswood Ave. CHICAGO 13, ILL.

WAUKESHA ENGINES



An airplane crashes . . . almost instantly it's afire . . . flaming furiously . . .

Up dashes the Cardox Airdrome Crash Truck . . . and with fast flowing foam and carbon dioxide from its hose nozzles, boom and bumper sprays . . . the fire is literally smothered . . . knocked out quick!

More than a fire-fighter . . . this truck is a lifesaver! With its Waukesha Engine, the crash truck is always *right there* . . . in time!

That's why it's so widely used . . . at Army Air Force, Navy, and commercial air fields.

Fully loaded, the truck weighs about 47,000 pounds but it makes 46 m.p.h. with its Waukesha Engine. Even more important is Waukesha's quick acceleration that assures exceptionally fast get-away. Most important of all is that Waukesha has the downright dependability to deliver maximum power in any and all emergencies.

That's *why* Sterling Motor Truck Company, Inc., of Milwaukee, who builds this Cardox truck chassis, equips it with this Model 6-WAL Waukesha Engine, gasoline-burning . . . 6 cylinders . . . 5¾ in. bore x 6½ in. stroke . . . 1013 cu. in. displacement . . . it delivers more than 200 hp. at 2,000 rpm.

With every modern feature of construction and design . . . this rugged Waukesha Super Duty Six is *the* engine for the super trucks and buses of tomorrow. Get Bulletin 1138. Consult Waukesha engineers.

MORE POWER FOR VICTORY

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS. • NEW YORK • TULSA • LOS ANGELES

What's the Cure?

Ever feel like the fellow above—as though you'd have to walk sideways to keep from flying? And all because of difficulty in getting enough of a certain kind of steel to tide you over.

As a matter of fact in these hectic times this frantic condition is not always immediately curable. However, it's amazing how much relief can often be secured in a matter of minutes by calling Ryerson.

We're not infallible of course. For, though we are shipping tremendous tonnages to war plants and critical industries from all eleven Ryerson plants—our stocks are not always balanced from a size standpoint.

But our stocks are still the nation's largest. Our personnel is highly trained and experienced. Our technical staff is exceptionally skilled. And all during our 103 years of business, we've been meeting and overcoming critical situations.

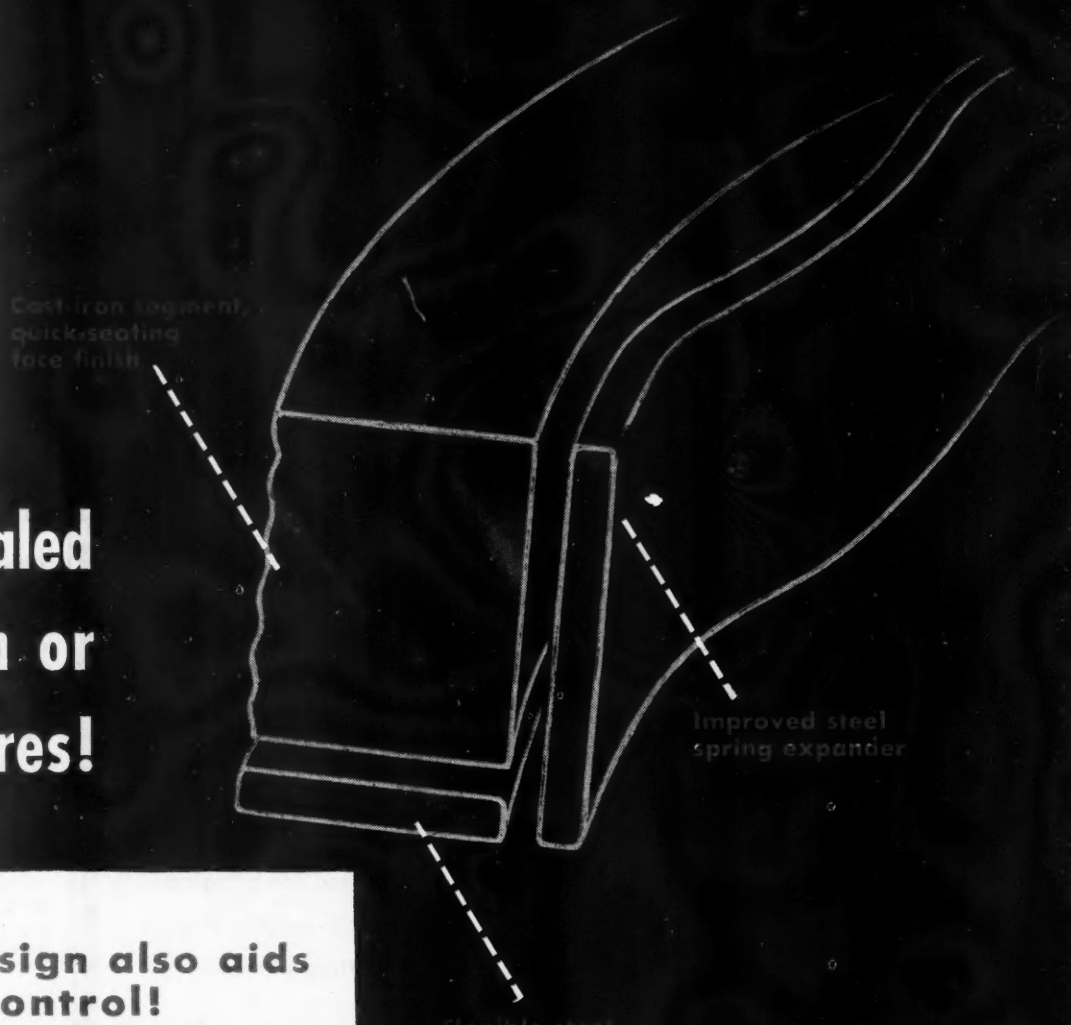
So if you find yourself even remotely approaching the condition of the harassed buyer above, remember this: Phone Ryerson—and from our end of the telephone we'll do everything within our power to take care of you.

JOSEPH T. RYERSON & SON, INC.
Steel-Service Plants at: Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston

RYERSON CERTIFIED STEELS

RYERSON STEEL

MUSKEGON Type
XSR "Steel Rail"
Compression Ring



blow-by sealed off in worn or tapered bores!

2-piece design also aids oil control!

The problem of excessive blow-by is of course aggrevated by wear in cylinder bores. Special ring design to offset the condition is a "must".

The Muskegon type XSR has proved effective not only as a compression ring but as an auxiliary oil ring. The cast-iron segment has a threaded face finish to aid in prompt mating with the cylinder bore. The flexible steel rail lower member, accurately cam-shaped, seals out-of-round cylinders against blow-by. An improved steel expander, with predetermined tension, supports the cylinder contacting members providing them with correct unit pressure.

The multiple piece construction of this design retains oil and aids in upper cylinder lubrication. Type XSR is recommended for re-ring applications—particularly in high-speed gasoline and Diesel engines. It is installed in the 2nd or 3rd compression ring groove. Consult Muskegon engineers. They have the correct ring type for every piston ring need.

MUSKEGON
Piston Rings

MUSKEGON PISTON RING CO.
MUSKEGON, MICHIGAN
PLANTS AT MUSKEGON AND SPARTA

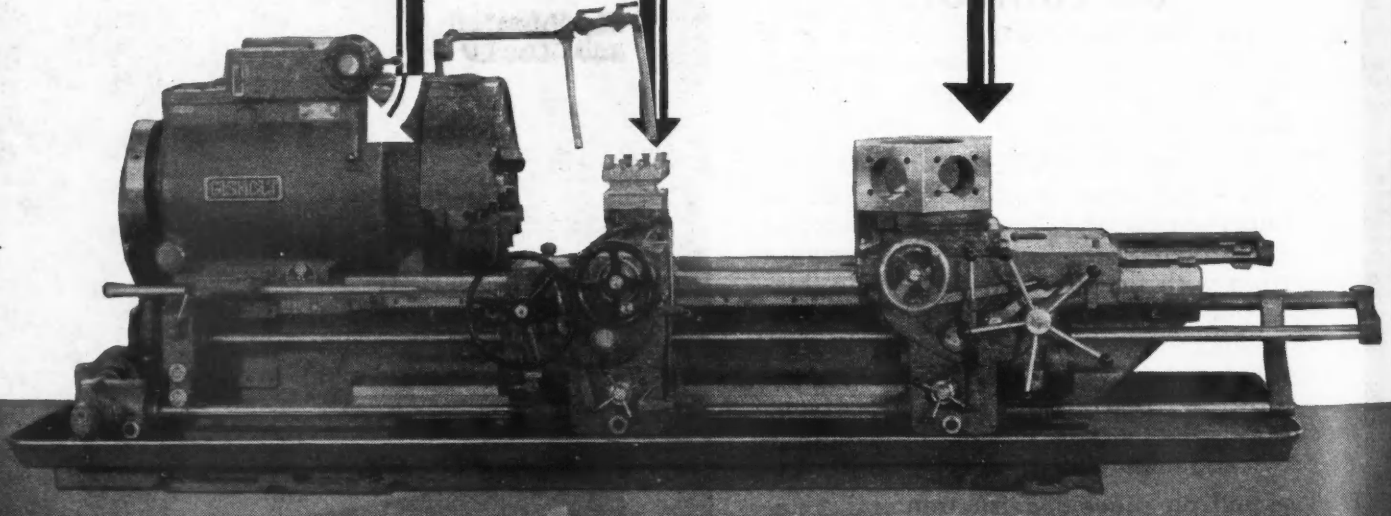
Adaptable . . .

Here's a Gisholt advantage that pays big dividends . . . the ability to handle a broader range of work when the need arises. Take, for example, the Gisholt 4L Saddle Type Turret Lathe. A big machine, to be sure, yet its flexibility and ease of operation enable it to handle smaller work too. Here are a few of the reasons why:

1 Hydraulic clutching and braking make it possible for the operator to start, reverse, or stop the spindle—as quickly and as effortlessly as on many smaller machines. One easy movement of one lever is all it takes. Response is instantaneous, smooth, positive.

2 Power rapid traverse for the side carriage is provided not only for longitudinal movement but also for in-and-out movement of the cross slide. Here's greater ease and speed for bringing tools quickly into cutting position.

3 This massive cross-feeding hexagon turret is more accurate—more adaptable with its 16 reversible feeds and automatic feed trips for both longitudinal and cross feeds. It can be locked rigidly on center for bar work—or chucking work with piloted tools.



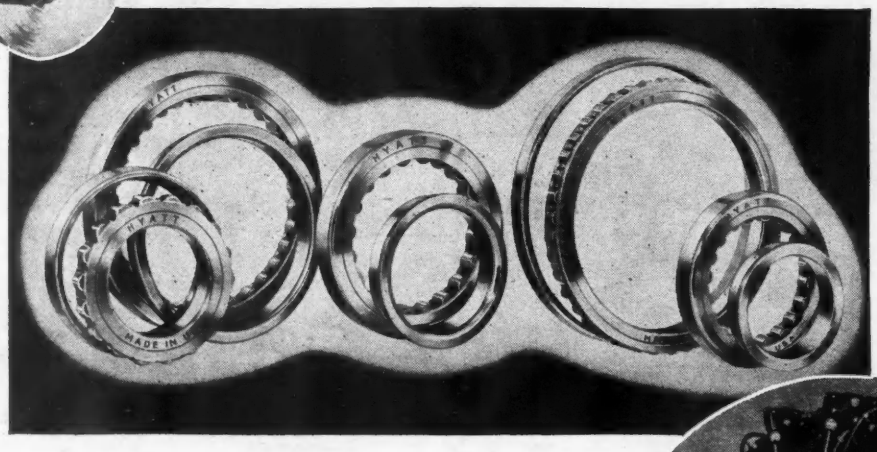
Adaptability is a fact that applies to both Gisholt Saddle Type and Gisholt Ram Type Turret Lathes. Make the most of it. Explore the possibilities of each type to assure the most flexible and economical set-up for your own production. Ask for literature.

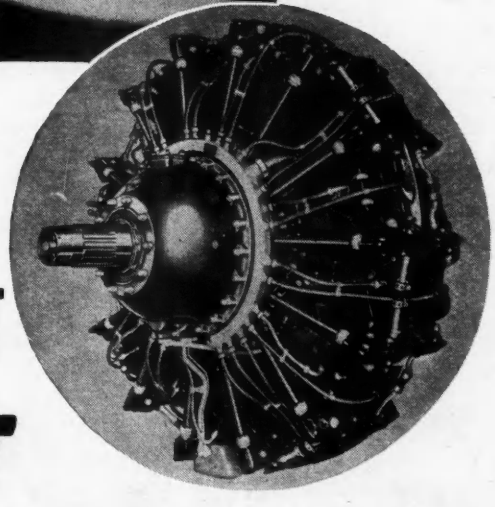
GISHOLT MACHINE COMPANY • 1205 *E. Washington Ave., Madison 3, Wis.*

Look Ahead...Keep Ahead...With Gisholt Improvements in Metal Turning

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES





Powered by P & W Engines Built by BUICK and CHEVROLET

CRANKSHAFT BEARINGS: HYATT

Crankshaft performance must be dependable—thus the thousands of P & W radial engines built by Buick and Chevrolet to power Liberator Bombers and Transport Planes are insured by the use of Hyatt Roller Bearings.

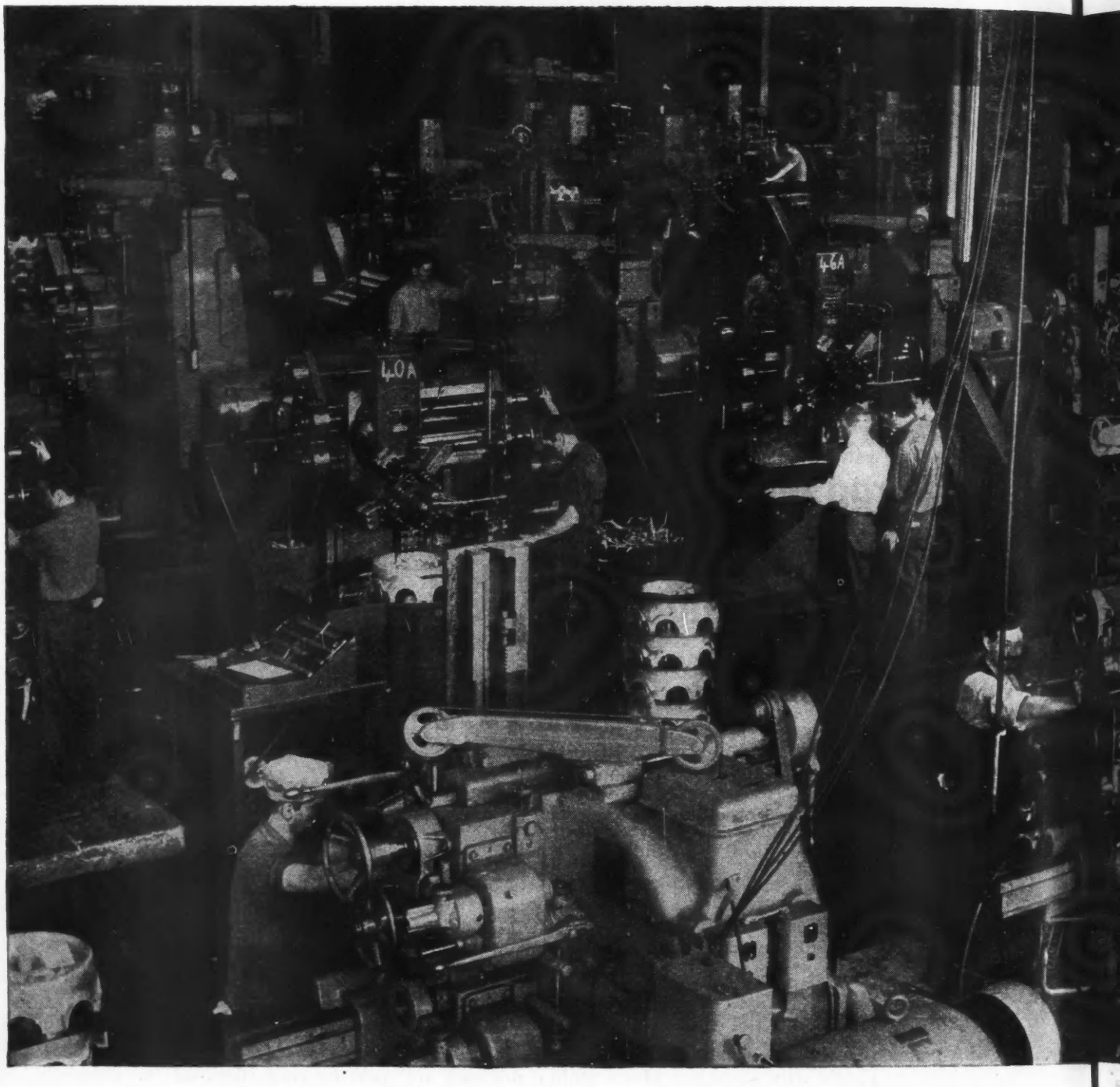
Close tolerances, freedom from defects and uniformity month in and month out are paramount and the technique developed by Hyatt over the past 53 years is the assurance of quality in aircraft bearings.

That's why so many Hyatt Roller Bearings are used in every field of industry, throughout agriculture and transportation, as well as in our weapons of war.

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION

Harrison, New Jersey • Chicago • Detroit • Pittsburgh • Oakland, California

RUST



TUNE IN THE
TEXACO STAR THEATRE
WITH JAMES MELTON
EVERY SUNDAY NIGHT
—CBS

TEXACO

TEXACO

PROOFING

GOVERNMENT-OWNED PRODUCTION EQUIPMENT

SEE **Ordnance Specification P.S. 300-4 for official instructions**

USE **Texaco Rustproofing Products**

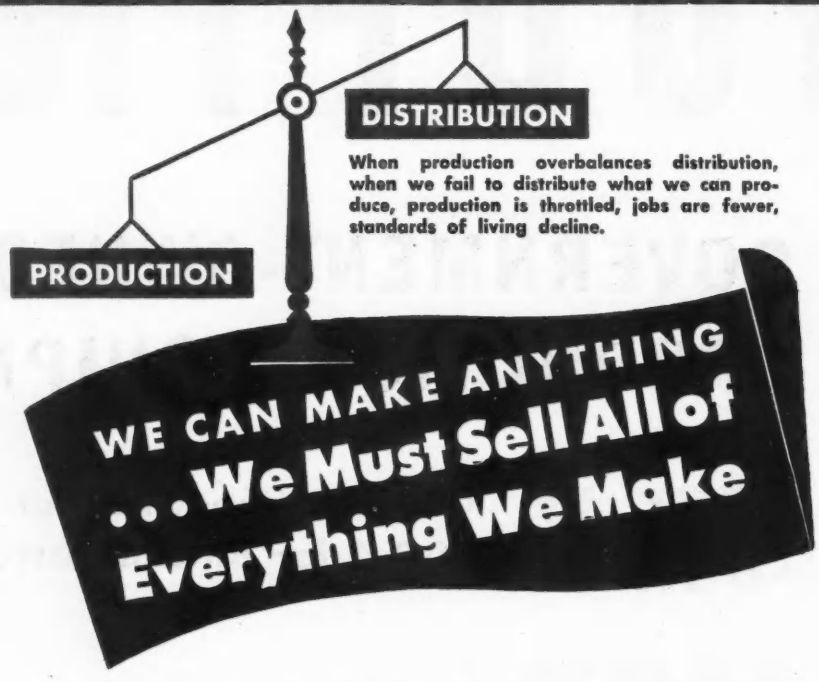
RECONVERSION time—when it comes to your plant—will call for prompt storage of Government-owned machines, precision tools and other production equipment. Before this equipment can be stored it must be rustproofed and processed *in accordance with official instructions.*

Ordnance Specification P.S. 300-4 gives exact specifications for rustproofing materials to be used on Government-owned equipment. Texaco rustproofing products meet Ordnance specifications. They are easily applied by brush, dip or spray, and the protective coating provided will assure preservation for years.

Act now to be ready for prompt reconversion rustproofing of your own as well as Government-owned production equipment when the time comes.

Whatever your rustproofing requirements, a Texaco representative can render helpful service. Get in touch with the nearest of the more than 2300 Texaco distributing plants in the 48 States, or write to The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Rustproofing Products


DISTRIBUTION
When production overbalances distribution, when we fail to distribute what we can produce, production is throttled, jobs are fewer, standards of living decline.
PRODUCTION

WE CAN MAKE ANYTHING ...We Must Sell All of Everything We Make

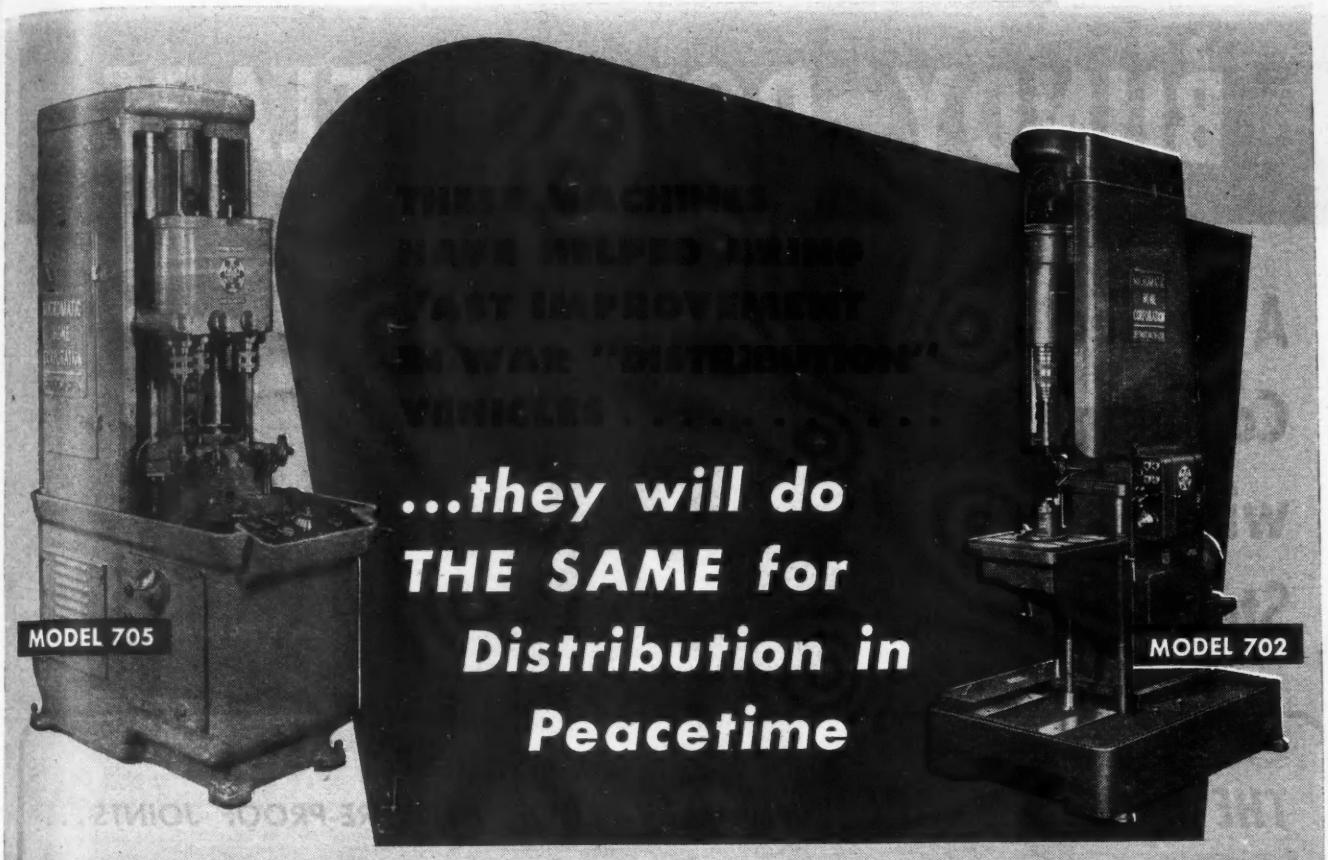
For a long time we in America have derived great comfort and assurance from the knowledge that we have the industrial ability to produce anything we may need or want. We have tied our wagon to the bright star of producing more products at higher wages to sell at lower prices.

This concept of production has brought us the largest expansion in a standard of living of any people in history.

But, while we have always been able to make anything, we have not always been able to sell all of everything we could make. We have not devoted the same enterprising energy to expanding distribution that we have to production. So, in the past, for immediate short swing relief we have resorted to government imposed restrictions on production and distribution. This expedient did not bring worth-while relief, for in the end it added up to fewer jobs, less production—higher prices.

If commerce and industry will use its inspirational ability and ingenuity to find better, cheaper methods of distribution per unit our goal of full employment may easily be accomplished and we can return to the enviable position of enjoying an expanding standard of living.

MICROMATIC HONE CORPORATION
DETROIT 4, MICHIGAN



While cost is a secondary consideration in distribution of war materials, other needs parallel peacetime distribution. Lighter, more easily operated equipment—higher pay loads—easier maintenance, and less of it—are all vital. Micromatic Honing machines have helped wartime distribution to these goals—will do the same for industry after the war. At the same time they will help lower initial and operating costs of distribution machinery—lower costs of goods delivered.

MODEL 705

VERTICAL HYDROHONER

Micromatic Model 705 Multiple Spindle Vertical Hydrohoner has built-in automatic Microsize Control which gauges work automatically—holds within tolerance of .0001" for geometric accuracy and .0003" for *uniform diameter size*—automatically stops honing cycle when correct size is reached. For internal honing or bores ¼" to 2" diameter. Rotary indexing work fixture provides high production. Usually recommended for maximum stock removal ranging from .0005" to .0015" on hardened parts—.001" to .010" on soft or medium hard. (Illustrated above, left).

Precision sphericity without measurable error is generated on ball studs by the Micromatic Ball Stud Honer.

Removes .030" stock on diameter from turned heat treated forgings.

Precision honing of long pieces—external or internal—is the work of the Micromatic Horizontal Floor Type Honer. Either hydraulic or manual control or tools. Set-ups available to generate either cross-hatch or co-directional finish patterns.

MODEL 702 Single Spindle Type HYDROHONER

Single Spindle Type Micromatic Hydrohoner Model 702 for rapid production honing of bores or cylindrical surfaces up to 2" in diameter. (Illustrated above, right).

Silver plated bearings are production honed on a Micromatic Horizontal. Costs were reduced 50% from previous methods.

MICROMATIC HONE CORPORATION

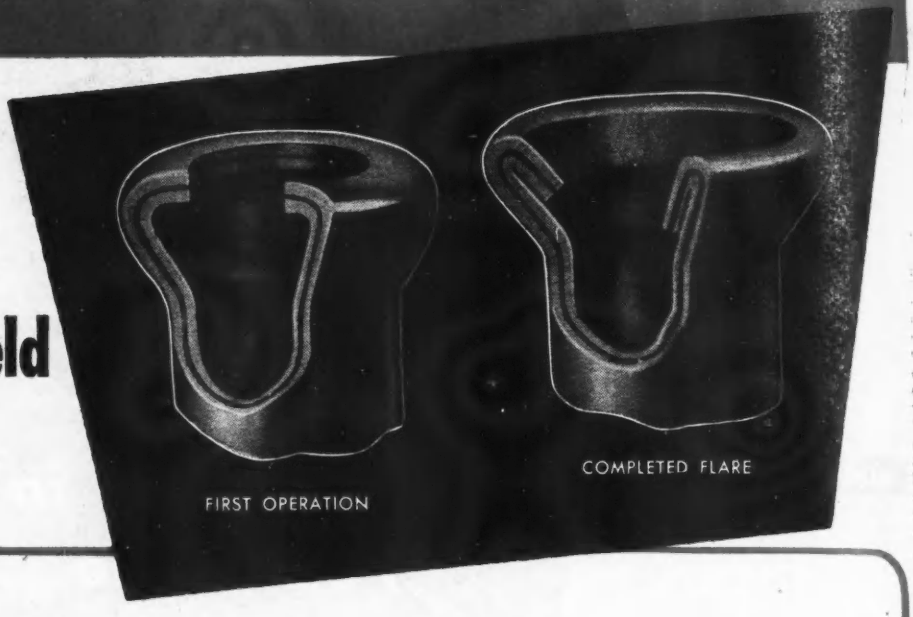
DETROIT 4, MICHIGAN

DISTRICT OFFICES: 614 Empire Building, 206 South Main Street, Rockford, Illinois • 129 Church Street, New Haven 10, Connecticut
501 Harries Building, 137 North Main Street, Dayton, Ohio • 1031 South Broadway, Los Angeles 15, California

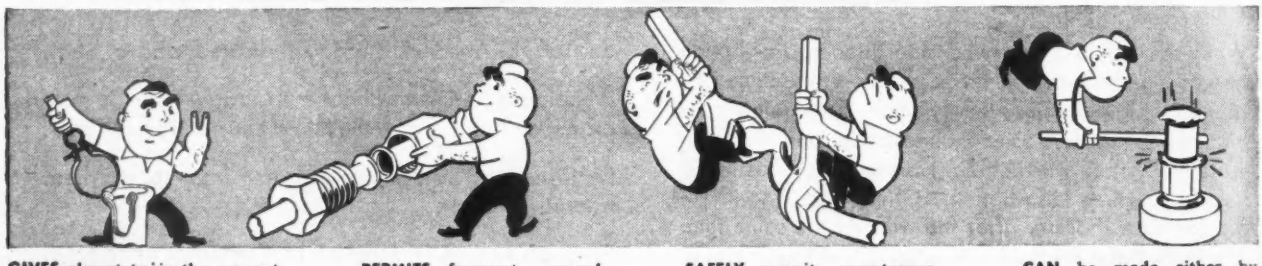
MAKERS OF HONING MACHINE TOOLS

BUNDY DOUBLE FLARE

A Perfect Combination with Bundyweld Steel Tubing



THE DOUBLE FLARE... FOR LEAK-PROOF, PRESSURE-PROOF JOINTS...



GIVES almost twice the amount of metal at the seat.

PERMITS frequent removal and replacement of fittings.

SAFELY permits over-torqueing. Held to close tolerance.

CAN be made either by hand or with machine tools.

WITH BUNDYWELD ... THE SOLID, DOUBLE WALL STEEL TUBE

1 Bundyweld Tubing is made by a process entirely different from that used in making other tubing. A single strip of copper-coated S.A.E. 1010 steel is continuously rolled twice laterally...

2 ..into tubular form. Walls of uniform thickness and concentricity are assured by the use of close tolerance cold rolled strip. This double rolled strip passes through a furnace where the . . .

3 . . copper coating fuses and alloys with the double steel walls. After brazing and cooling, it becomes a *solid* double wall steel tube, copper brazed throughout 360° of wall contact . . .

4 . . copper coated inside and out, free from scale, and closely held to dimensions. Hard or annealed in standard sizes up to ⅝" O.D. Special sizes cold drawn. Also furnished in Monel.

For further information, write Bundy Tubing Co., Detroit 13, Mich.

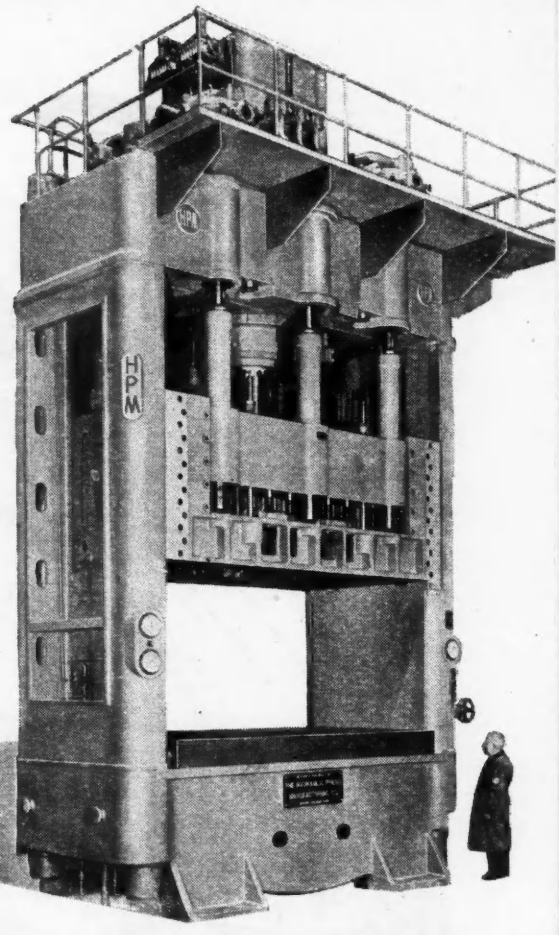
BUNDY TUBING

ENGINEERED TO YOUR EXPECTATIONS

BUNDY TUBING DISTRIBUTORS AND REPRESENTATIVES:

Pacific Metals Company, Ltd. 3100 19th Street San Francisco 10, California	Standard Tube Sales Corp. 1 Admiral Avenue Maspeth, New York City, N. Y.	Lapham-Hickey Company 3333 W. 47th Place Chicago 32, Illinois	Rutan & Company 112 South 16th Street Philadelphia 2, Pennsylvania	Eagle Metals Company 3628 East Marginal Way Seattle 4, Washington

DRAW THOSE BIG JOBS HYDRAULICALLY!



The H-P-M "All-Hydraulic" double-action press offers many advantages in the deep drawing of large sheet metal parts. The speed of the draw punch is under absolute control. A fast ram advance, with automatic slow-down prior to die contact minimizes the possibility of rupturing the metal at the start of the draw. Main slide, blankholder and die cushion pressures can be easily and independently adjusted. When drawing irregular shapes, blankholder pressure is adjustable at each blankholder ram, allowing the metal to slip more freely at certain points than others. Automatic reversal of the press at a predetermined pressure guarantees uniform results and protects both dies and press.

Are you planning to produce large sheet metal stampings? Powered by the reliable H-P-M HYDRO-POWER operating system, H-P-M FASTRAVERSE presses are designed for both versatile and high speed production. Write today, stating your requirements.

THE HYDRAULIC PRESS MFG. CO.

Mount Gilead, Ohio, U. S. A.

Branch offices in New York, Philadelphia, Cleveland, Detroit and Chicago.
Representatives in principal cities.

Installed in a plant in England, this 750-ton H-P-M double-action press draws massive airplane fuselage sections. Press is equipped with a 400-ton hydraulic blankholder and a 133-ton hydraulic die cushion. Pressing surfaces are 144" x 84". Complete press is illustrated above.

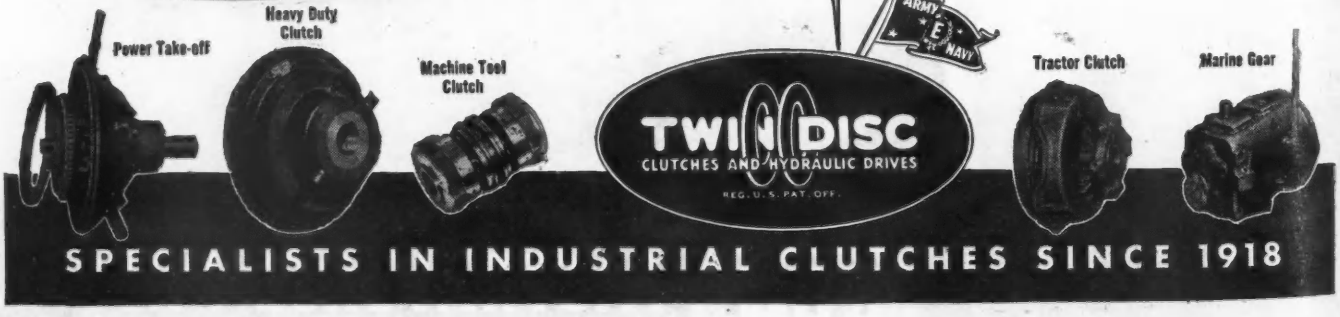
HPM **FASTRAVERSE PRESSES**

FOR DEEP DRAWING SHEET METAL

Easier to get in motion

When a Twin Disc Hydraulic Coupling is applied to equipment requiring the rapid acceleration of heavy loads, the load is brought up to speed easier. The power is applied to maximum advantage . . . smooth, rapid acceleration is obtained . . . danger of stalling eliminated.

You will find that a Hydraulic Coupling gives you other important benefits, too. It is fabricated from steel sheets, formed and welded into solid units. This construction assures greater strength than the conventional casting . . . reduces weight by 30% . . . provides shorter axial length, thereby cutting space requirements. These and many other advantages of Twin Disc Hydraulic Couplings are fully described in a special engineering bulletin—No. 136. Why not send for it today? TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).



SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

See

HOW MUCH YOU CAN SAVE

With

SHAKEPROOF

THREAD-CUTTING SCREWS

- *Eliminate Tapping!*
- *Speed Assembly!*
- *Reduce Costs!*

SEND FOR FREE TEST KIT!

Drive these screws yourself. Watch them actually cut their own threads easily in any thickness of metal. See what a snug, tight fastening each screw produces. Write for your Test Kit No. 22, today!

It's simple! Just figure what tapping costs you per thousand machine screws used—and don't forget to add the cost of taps and maintenance. These costs are what you eliminate with Shakeproof Type 1 Thread-Cutting Screws. And, what's more, you save vital assembly time and get tighter, stronger fastenings, too! Get complete data and prices on this faster, lower cost assembly method now!

ARMY E NAVY

SHAKEPROOF inc.

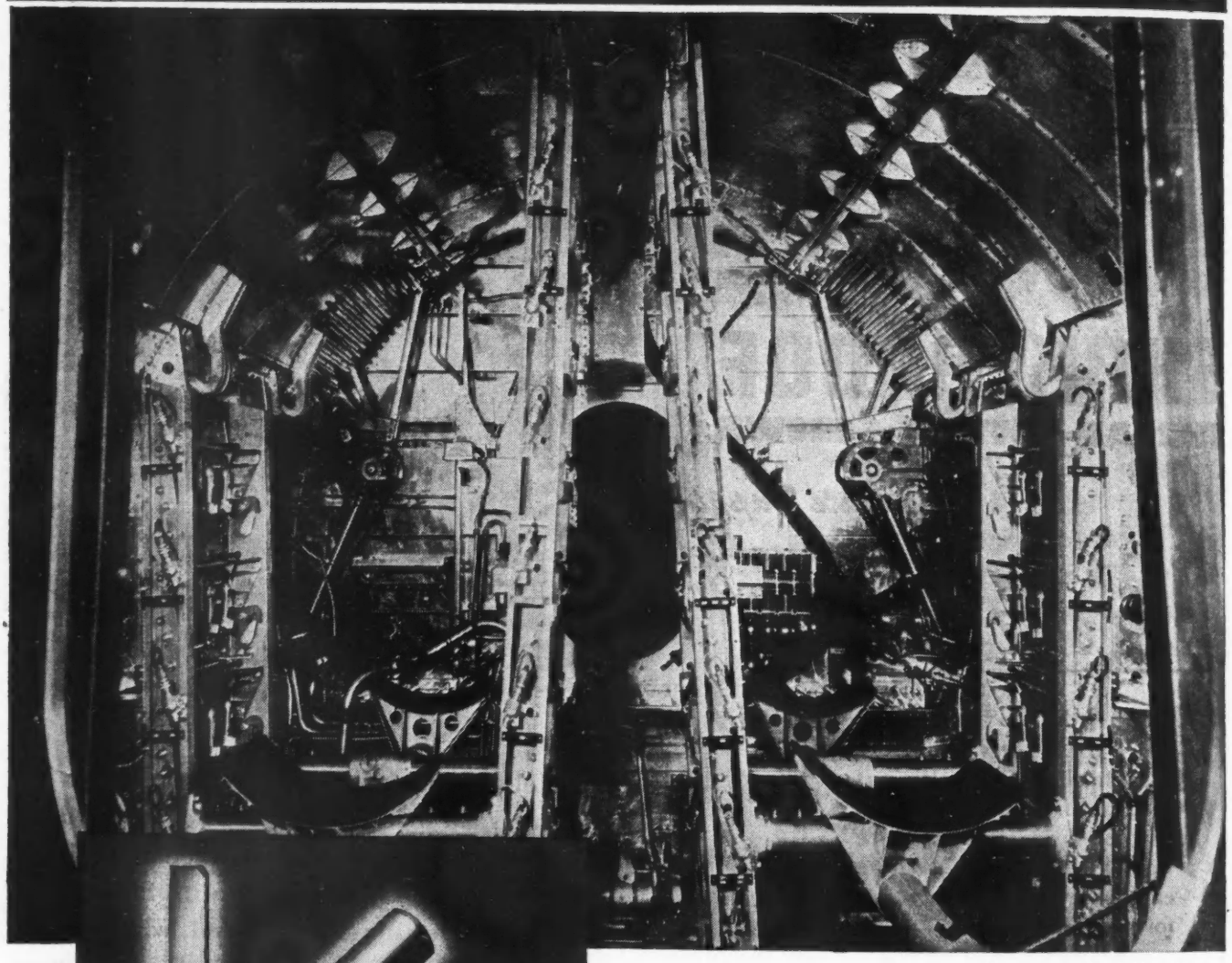
fastening Headquarters

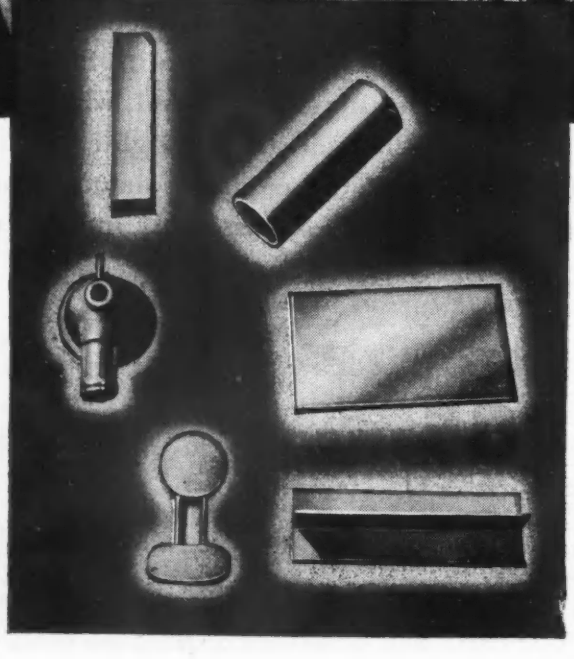
Distributor of Shakeproof Products Manufactured by ILLINOIS TOOL WORKS
2501 North Keeler Avenue, Chicago 39, Illinois
Plants at Chicago and Elgin, Illinois • In Canada: Canada Illinois Tools, Ltd., Toronto, Ontario

Los Angeles Office
5670 Wilshire Blvd., Los Angeles 36, Cal.

Detroit Office
2895 E. Grand Blvd., Detroit 2, Mich.

How UP-TO-DATE are you on ALUMINUM?





Photos, courtesy Glenn L. Martin Company

HERE IS THE BOMB BAY of a B-26 Martin Marauder. Into the construction of this section alone go hundreds of parts manufactured from six basic forms of Reynolds aluminum alloys.

As goes the aircraft industry, so goes *all* industry tomorrow! Aircraft manufacturers today not only receive prefabricated aircraft parts from Reynolds, but in addition use this company's aluminum and aluminum alloy stock in their parts production.

THE GLENN L. MARTIN COMPANY called upon Reynolds to supply six basic shapes for production of parts shown here. Included were bar, tubing, castings, sheet, forgings and extrusions.

WHAT ARE YOUR TOOLS and DIES DOING TO YOUR PRODUCTION COSTS?

Even in plants where everyone is satisfied with tool and die life, surprising improvements are made when the Carpenter *job analysis plan* is put to work. And the best part is that you can use it with very little extra effort and get—

- **Better Heat Treating Results**
- **More Pieces Between Grinds**
- **Less Machine Down Time**
- **Lower Tool Costs**
- **Lower Production Costs**

THIS 3-*STEP JOB ANALYSIS* PLAN GIVES YOU *BETTER TOOLS* AND *LOWER UNIT COSTS!*

1. *The Way to Match Tool Steel to the Job...*
Suppose you are hunting for *greater toughness,* more *wear resistance* or greater *hardening accuracy* in a tool. With the Carpenter Matched Set Method you can eliminate guesswork. The nine tool steels shown on the Matched Set Diagram will solve 90% of the problems that come up in your tool room. With the diagram and the Carpenter *Matched Tool Steel Manual* you can actually predetermine tool performance on each job. The Manual contains an 80-page Tool Index and Steel Selector that quickly points to the best starting place when you have a tool to make. If you are responsible for tool production and costs, be sure to have a copy of this helpful Manual on your desk.

2. *How to Get Better Hardening Results...*
The second step in your analysis of each job is a check-up on heat treating methods. For proper heat treatment improves hardening results and reduces tooling costs. It also protects your tool design and steel selection recommendations.

The new Carpenter Heat Treating Guide can help you check your heat treating methods to get more from the tool steel you use. It is a slide chart that quickly gives your heat treaters complete, accurate information. It also contains tips on quenching, furnace atmospheres, etc. This Guide is free to tool steel users in the U. S. A., so send for your copy.

3. *And Now to Reduce Unit Costs...*
Check on tool life and output per grind! Every time a tool setup is torn down, every time a tool has to be made over, costs shoot up. By using the Carpenter Matched Set Method and keeping a close check on the results—you bring down costs.

And for personal help with your tool steel job analysis program, call your Carpenter representative. He has the kind of experience that can help you answer the question: "What are my tools and dies doing to production costs?"

THE CARPENTER STEEL COMPANY
103 W. BERN STREET • READING, PA.

Carpenter
MATCHED
TOOL STEELS

Count on Stinson

FOR LEADERSHIP IN PERSONAL PLANES

THE FIRST STINSON PLANE BUILT, back in 1926, combined features new to the world of flying. Such innovations as enclosed cabin, wheel brakes, electric starter, and cabin heater made this 1926 Stinson a "standout."

And built into this first Stinson was an *inherent stability* that has been an outstanding characteristic of every Stinson plane built during our 19 years of leadership in private flying.

Stinson has pioneered in the development of safety devices and *safety design* for personal planes. As a result, Stinson planes have an unequalled safety record in the air.

SOME STINSON "FIRSTS" IN 19 YEARS OF BUILDING QUALITY PLANES

FIRST to fly from Detroit to Tokyo.

FIRST to fly from New York to Bermuda.

FIRST to carry air mail in China.

FIRST to carry government mail in Mexico and in the Philippines.

FIRST to explore the Greenland route to Europe, the present-day route of the North Atlantic Air Ferry.

FIRST to provide air-mail pickup service.

Stinson Planes for War

Wherever our men are fighting, on fronts around the globe, the Stinson Sentinel L-5, the "Flying Jeep," is a familiar and welcome sight.

These famous Stinson liaison planes serve as "air eyes" for the armed forces, as parachute supply planes on jungle commando missions, as flying ambulances, and on important and hazardous liaison duty—almost always in the thick of battle.

Here at home, Stinson Voyagers have carried out 65 per cent of the Civil Air Patrol's operations.

The Stinson Reliant AT19 is widely used by the British as a navigational trainer. And Stinson planes are used by almost every airline in the United States to train and check pilots.

TWA Constellation by Lockheed

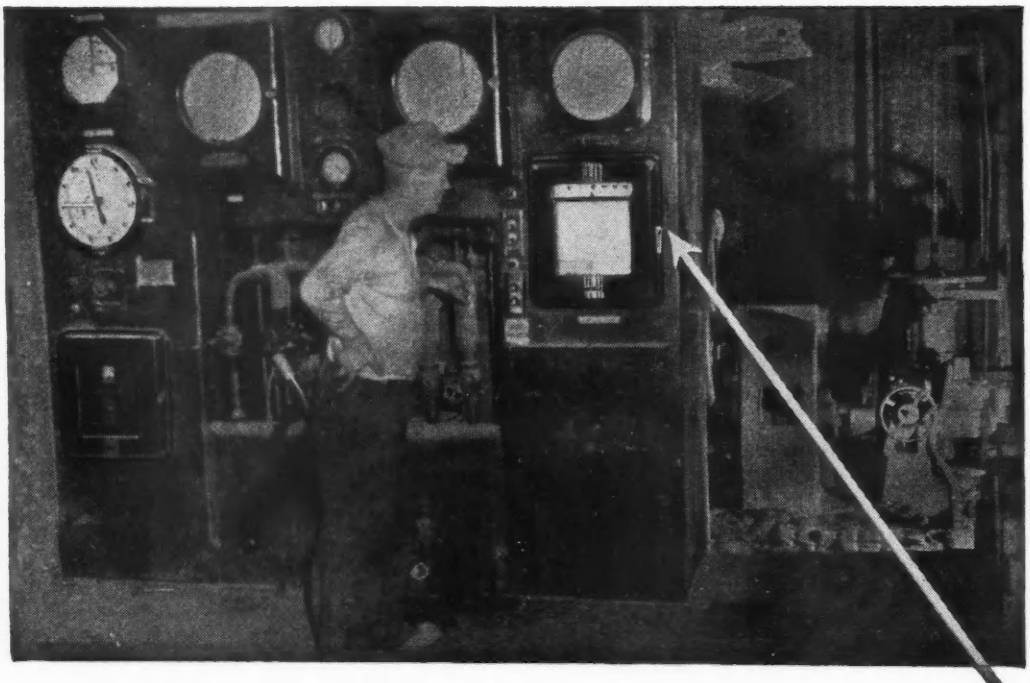
DESIGNED FOR PEACE, DRAFTED FOR WAR. That's the story of the Constellation. Originally planned for TWA . . . for new luxurious, five-mile-a-minute cross-continent service . . . these super air liners joined the Army Air Force instead . . . carrying not 57 passengers in deep-cushioned chairs but providing sterner accommodations for 100 fully armed soldiers.

But when the war is over, the Constellation will return to the job awaiting it . . . that of carrying mail, passengers and express over the TWA system.

And when the war is over, many of the remarkable developments contributing to military aviation again will be ready to serve in other fields. PESCO design and manufacturing experience in meeting the exacting demands of military aviation will be available not only to commercial aviation, but also to industry in expanded and more effective industrial applications of Pressurized Power and Liquid Flow. For descriptive literature, write PESCO Products Co., division of Borg-Warner, 11610 Euclid Avenue, Cleveland 6, Ohio.

In Precision Hydraulics, Fuel Pumps, Air Pumps, Related Accessories . . .

PERFORMANCE POINTS TO Pesco FIRST



ARMY NAVY
V depends on me!
A Slogan For Every American

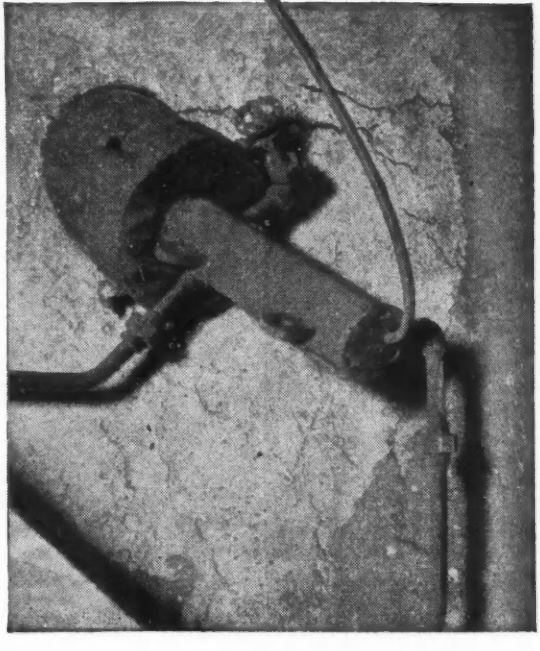
RAYOTUBES IN CHECKERS SAVE MONEY FOR INLAND STEEL

Inland's Indiana Harbor plant reduces maintenance costs by replacing the thermocouples in the checker chambers of their 36 open-hearth furnaces with Rayotubes. Where the thermocouples demanded considerable attention and burned out frequently, Rayotubes required little maintenance other than an occasional cleaning and checking. Once a Rayotube is installed, it's there to stay; it holds its calibration, and it *does not burn out*. Instead of going *to* the heat, as thermocouples do, Rayotubes stay in a safe location and receive radiation *from* the hot surface on which they are sighting.

And Rayotubes are giving Inland much better recorder readings than thermocouples formerly gave. This is partly due to the extreme sensitivity of Rayotubes; since they are sighted directly on the roof of the neck arch, with no protection tubes, they have no lagging and consequently detect every change in temperature the instant it occurs.

Another and equally important reason for the success of Rayotubes in this plant is that they measure temperature at a location which is too hot for couples. By thus working nearer the maximum, they assist the First Helper in avoiding refractory damage.

Our engineers will be glad to make specific recommendations for use of Rayotubes, or they will send Catalog N-33B, as you prefer.



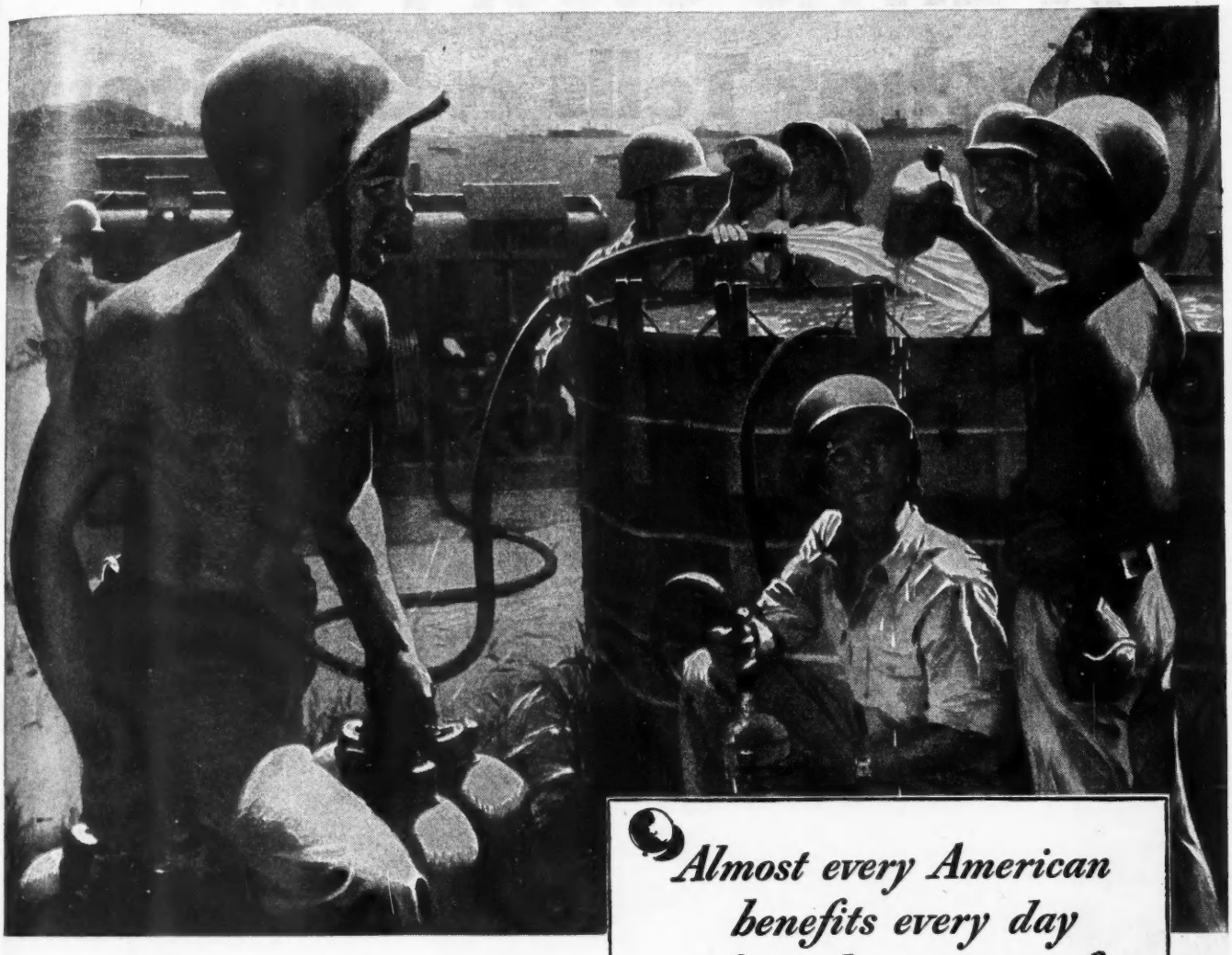
This Rayotube at Inland Steel Co., Chicago, is mounted in the checker chamber wall of an open-hearth furnace. It receives radiation and reports temperature to the Micromax Recorder (see arrow) by means of the leadwire, just as a thermocouple would do.

LEEDS & NORTHRUP COMPANY, 4966 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

G. I. Joe makes salt water fresh!



Almost every American benefits every day from the products of
BORG-WARNER

American ingenuity turns the ocean into a well!

As our forces advance in the Pacific they carry with them one of the most important tools of war—the now famous Cleaver-Brooks still. With it, the engineers turn the ocean and stagnant pools into wells of pure, sparkling drinking water!

A big problem has always been to transport the large amounts of fuel needed to distill sufficient quantities of water for troops at the front. So the remarkable feature of these new portable "waterworks" lies in their fuel economy.

To help accomplish this saving, they're now equipped with a new type compressor, specifically designed for the job by Borg-Warner's B-W Supercharger Division. And they're delivering up to 175 pounds of pure water for every pound of gasoline they burn . . . compared to the old ratio of 37 pounds.

Normally, this Borg-Warner division works to improve the performance of gasoline and diesel engines. Its assistance in cutting the cost of water purification is a perfect wartime example of Borg-Warner's quick adaptability to new problems of design and engineering.

Borg-Warner's basic principle, "design it better—make it better," has long guided the production of many items of essential equipment now in daily use by almost every American.

ENGINEERING B-W PRODUCTION

These units form Borg-Warner: BORG & BECK • BORG-WARNER INTERNATIONAL • BORG WARNER SERVICE PARTS • B-W SUPERCHARGERS, INC. • CALUMET STEEL • DETROIT GEAR • DETROIT VAPOR STOVE • INGERSOLL STEEL & DISC • LONG MANUFACTURING • MARBON • MARVEL-SCHEBLER CARBURETER • MECHANICS UNIVERSAL JOINT • MORSE CHAIN • NORGE • NORGE MACHINE PRODUCTS • PESCO PRODUCTS • ROCKFORD CLUTCH • SPRING DIVISION • WARNER AUTOMOTIVE PARTS • WARNER GEAR

A Little Steel Part that Tells a Big Story

Republic

REPUBLIC STEEL — PRODUCTION FOR VICTORY

DS

UNION COLD DRAWN STEELS

Reg. U. S. Pat. Off.

Free-Machining Bessemer, Open-Hearth and Electric Furnace Steels

•

Union Cold Drawn Special Sections

•

Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting).

Man's Genius for making things is limited only by the physical properties of the substances used to make them.

MR. ENGINEER.. Here's a *sirvis* Lifesaver

It is a tough, flexible, molded chrome tanned leather diaphragm specially made to meet exact specifications. This diaphragm is in contact with heavy gear lubricant on one side and mud, dirt and water on the other. It performs the job of absolutely sealing the final drive case of track-type tractors, retaining the lubricant and keeping out all detrimental foreign substances like dirt, water or mud. The tractors which are equipped with these Sirvis diaphragms are essential to army logistics and each diaphragm *is* a lifesaver for the tractor. It protects both the power unit and the steering equipment. That is why it was so carefully made to special design requirements, from tough, flexible, high-tensile leather, tanned and treated by special Sirvis processes and manufactured under rigid laboratory controlled conditions. And, all this is characteristic of *every* Sirvis leather product.

If mechanical protection is your problem, draw upon Chicago Rawhide's unparalleled reservoir of 66 years' experience in specialized engineering. If you require unusual precision, resilience, long service or resistance to pressure, shock or vibration in packings, washers, gaskets or couplings . . . Chicago Rawhide research can develop the properties you need, and careful production control can assure the most exact processing. For precision performance, specify Sirvis mechanical leather.

sirvis

MECHANICAL LEATHER

A Product of

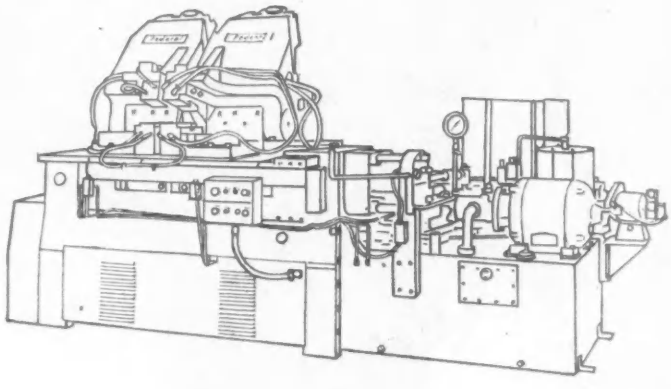
CHICAGO RAWHIDE MANUFACTURING CO.

1305 Elston Avenue **Chicago 22, Illinois**

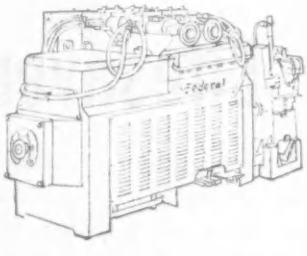
New York • Philadelphia • Detroit • Los Angeles • Cleveland • Boston
Pittsburgh • San Francisco • Cincinnati • Portland • Syracuse • Peoria

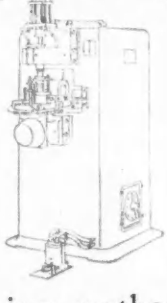
For Fabrication of Metal Resistance Welding Downs Ups Production . . .

The Federal Machine and Welder Company offers the metal working industry increased efficiency in production through resistance welding.



Federal makes all types of resistance welders: for example, heavy duty units typified by the 1000 KVA butt flash welder sketched at right, are made to weld heavy steel rings up to seven feet in diameter. These welders produce high quality forged welds in cross sections up to 18 square inches of high carbon steel, greater areas of mild steel. Similar jobs might be large ring gear blanks, rotating platform bearings, perhaps locomotive tires . . . Sash welders, such as sketched at left, speed production on steel sash of all kinds, are typical of the smaller butt and flash welders adaptable to everything from table knives (stainless welded to mild steel) and tools (high carbons to mild), to all kinds of metal tubing, rods and strips (including copper to aluminum in special instances), with either automatic or hand operation . . . Press type welders, amazingly versatile units for all kinds of projection welding, can be adapted by die changes to an infinite variety of fast assembly of metal parts. One suggested in the right hand corner of this page welds handles to pots and pans of enameling steel (adaptable for aluminum) and in actual production has cut costs to one-fifth that of previous method . . . And, speaking of versatility, one of the most useful tools in metal fabrication is the





THE FEDERAL MACHINE AND

LOOK OUT BELOW

You rarely need bother about the nut loosening on your bolted assemblies. It's the other parts that loosen as their contacting surfaces inevitably wear down.

A nut cannot budge while there is the slightest pressure between its threads and the threads of its bolt. But look out below the nut—where looseness develops from bolt stretch, and the frictional wear of metal on metal, burrs, flares, and the pulverizing of paint, scale or rust.

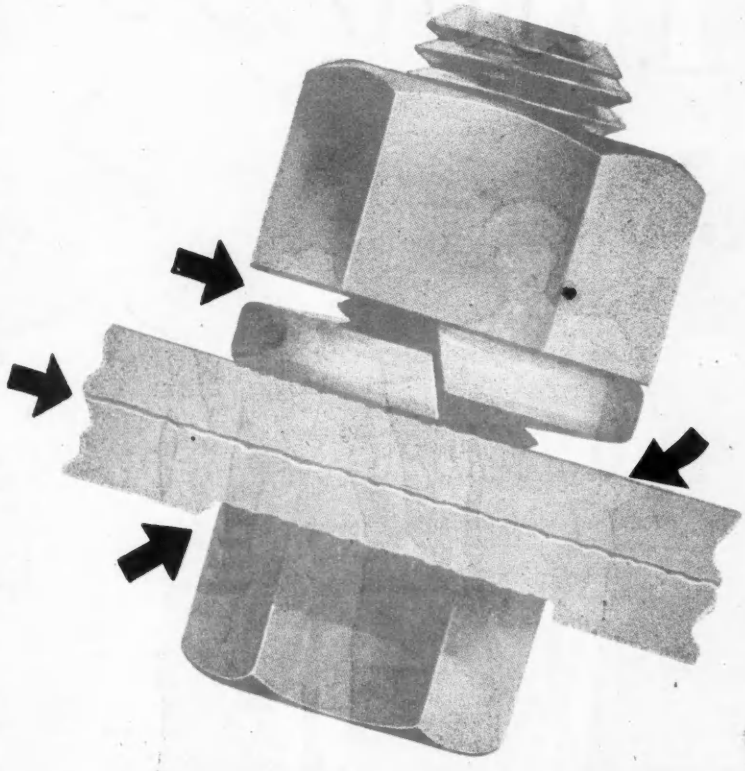
You can retard this inevitable wear only by using a powerful spring washer which expands as the wear occurs.

Kantlinks expand over a wide range, and thus hold all parts tight. No device other than a spring can do this job.

Whether you use a standard nut or any one of the many fixed or lock-nuts you need a strong spring washer.

If you want real bolted security, specify Kantlinks.

Send today for descriptive folders.



Our Kantlink Spring Washers conform to Ordnance Standard Specification BECX 1-2-3-, and Army-Navy Aeronautical Standard AN 935, and U. S. Navy drawing 12-Z-22.

Originators of KANTLINK the long-range spring washer

NATIONAL LOCK WASHER COMPANY

NEWARK 5, NEW JERSEY **MILWAUKEE 2, WISCONSIN**

IMMEDIATELY after Pearl Harbor, the airlines gave up half their planes to a hard-pressed Uncle Sam. Then, as the tempo of war picked up and the nation demanded speed and more speed, the men and women who fly our sky routes turned in one of the greatest jobs in transportation history.

Working against terrific handicaps in shortage of equipment, the airlines carried more and more and more. Passengers and freight increased. The load ratio went from 59% in 1941 to an "impossible" 90% in 1944. Planes put in more and more hours per day . . . until many were flying eighteen out of twenty-four, and only perpetual overhaul kept them going.

Through three long, tough years, maintenance crews fought the battle of the monkey wrench to keep America's precious, time-saving handful of commercial ships in the air and on schedule. Month in and month out pilots flew them sweet and careful . . . nursed them for speed . . . hung up new safety records . . . delivered vital goods and people to keep the war effort running at an ever faster pace.

Today, with relief in sight, the airlines are pointing the way for postwar America and the world. Against high wartime operating costs, they recently announced rate cuts. Airline route mileage in U. S. is at an all-time high of 62,937 miles. Freight carried is nearly four times

New high-solids lacquer . . .

» LIKE ADDING ANOTHER FINISHING DEPARTMENT

With high-solids lacquers providing coatings of twice the usual thickness, finishing departments can turn out far more work with no increase in space, manpower, or equipment. Each coat now does the work of two! Higher percentages of lower-viscosity nitrocellulose have made this possible. Increased thickness and protection are noticeable only after drying. Investigate high-solids lacquers now . . . for high-speed finishing of metal, wood, fabric, rubber, leather, paper, plastics . . . and see what time and money you can save.

ASK YOUR LACQUER SUPPLIER for complete details and application data on these new time-and-money-saving lacquers, as they become available. Hercules does not make high-solids lacquers, but concentrates on the production of the highest quality nitrocellulose from which they are made.

CL-54A

HERCULES

Cellulose Products Department
HERCULES POWDER COMPANY
INCORPORATED
964 Market St., Wilmington 99, Del.

Here a new science attacks an old problem

Cylinders in engines usually get a pretty raw deal. They have to take more grueling punishment than any other part of the engine. They . . . and the rings . . . bear the brunt of the blame when engines lose power.

Here, in the Van der Horst Research and Engine Testing Laboratories, we are continuously attacking this old problem of wear. The new science of PORUS-KROME processing is attuned to the needs of the various types of engines. Tests are run in several types of engines to determine the degree and type of porosity which will give the maximum wear resistance. Every development or change in PORUS-KROME processing is forthwith scrutinized by the "Lord High Inspector" . . . *the engine.*

Let's work out *together* a square deal for *your* cylinders. Our engineers will gladly develop with your engineers the specifications which will multiply cylinder life 4 to 20 times . . . ring life 3 to 5 times. The entire facilities of these laboratories are committed to solving the problem of cylinder wear for engine manufacturers.

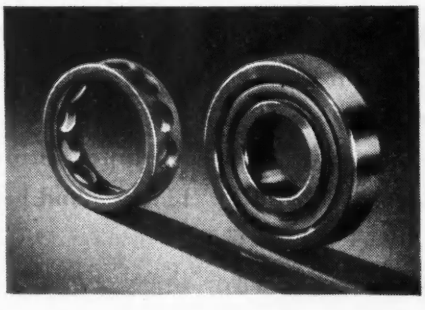
Even though building of engines for general use is still restricted, it is none too soon to plan for the use of PORUS-KROME in postwar engines. A request from you will bring complete information about PORUS-KROME. *Van der Horst Corporation of America, Olean, New York, Cleveland 11, O.*

PORUS - KROME . . . *Good for the Life of your Engines*

"SUPERCHARGING" NIPPON'S SKIES

BEFORE THE BOEING B-29s' first mission, engineers had to conquer the stratosphere — enable the giant planes to fly at glacial altitudes for gruelling hours. The "secret weapon" that solved the problem is a turbo-supercharger. Its most important component parts are super-precision anti-friction bearings mounted in laminated plastic retainers. Made from BAKELITE laminating varnishes, these retainers function at exceptionally high bearing speeds—up to 30,000 r.p.m. They also operate at temperature extremes, ranging from 350 deg. F. to 60 deg. below zero.

Laminated plastics based on BAKELITE resin varnishes give designers, product engineers, and industry the advantages of dimensional stability and of machineability to extremely close tolerances. Light in weight, high in dielectric strength, low in oil absorption, and exceptionally resistant to abrasion, laminated plastics in sheet, tube, and rod form, bring an outstanding combination of properties to such diversified products as gears, electrical coil forms, aircraft pulleys, fairleads, and propeller supports, telephone, radio and television equipment, hospital table tops, industrial helmets, and countless other products.



Write Department 27 for booklet describing laminated plastics, made from BAKELITE laminating varnishes.

TRADE (B∞) MARK

BAKELITE CORPORATION
Unit of
Union Carbide and Carbon Corporation
UCC
30 EAST 42ND ST., NEW YORK 17, N.Y.

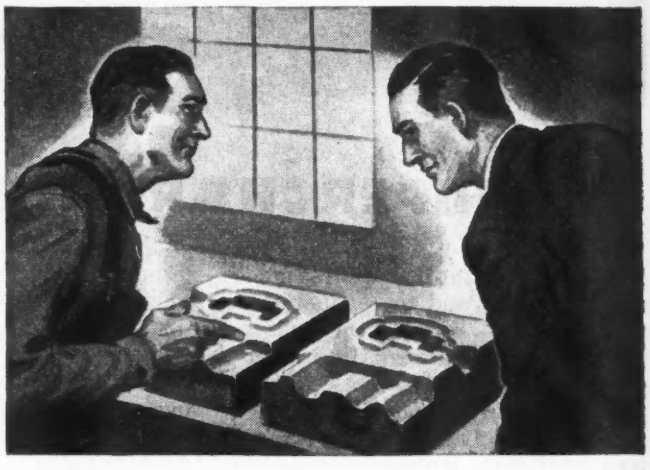
BAKELITE LAMINATING PLASTICS

TRADE-MARK

Timely Tip for Tool Engineers

1 "Jim, we're going to need a lot of new equipment quickly—dies, jigs, fixtures, tools. Better check the tool engineers and make a list of what we'll need. I want to get the order in right away."

2 "When you place the orders for this equipment, I'd like to go on record as recommending Brown's tool shop. The quality and accuracy of their work is tops in my book."



3 "See this die? Accurate to a whisker . . . and that goes for everything we get from Brown. The answer's easy . . . they're Pratt & Whitney-equipped throughout—from die sinkers to Hoke blocks—and believe me, you can tell the difference."

There are no two ways about it . . . the better your shop is equipped, the better the quality of your work. That's why the man who is planning new tools for war use now (or for reconversion later) is wise to order them from a shop that has P&W machines, tools and gages. He can be sure of just that much better quality and precision in everything he buys. And usually Pratt & Whitney equipment turns out precision jigs and fixtures faster. Write to us for full information.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

Jet Propelled Planes Demand the Best in Forgings

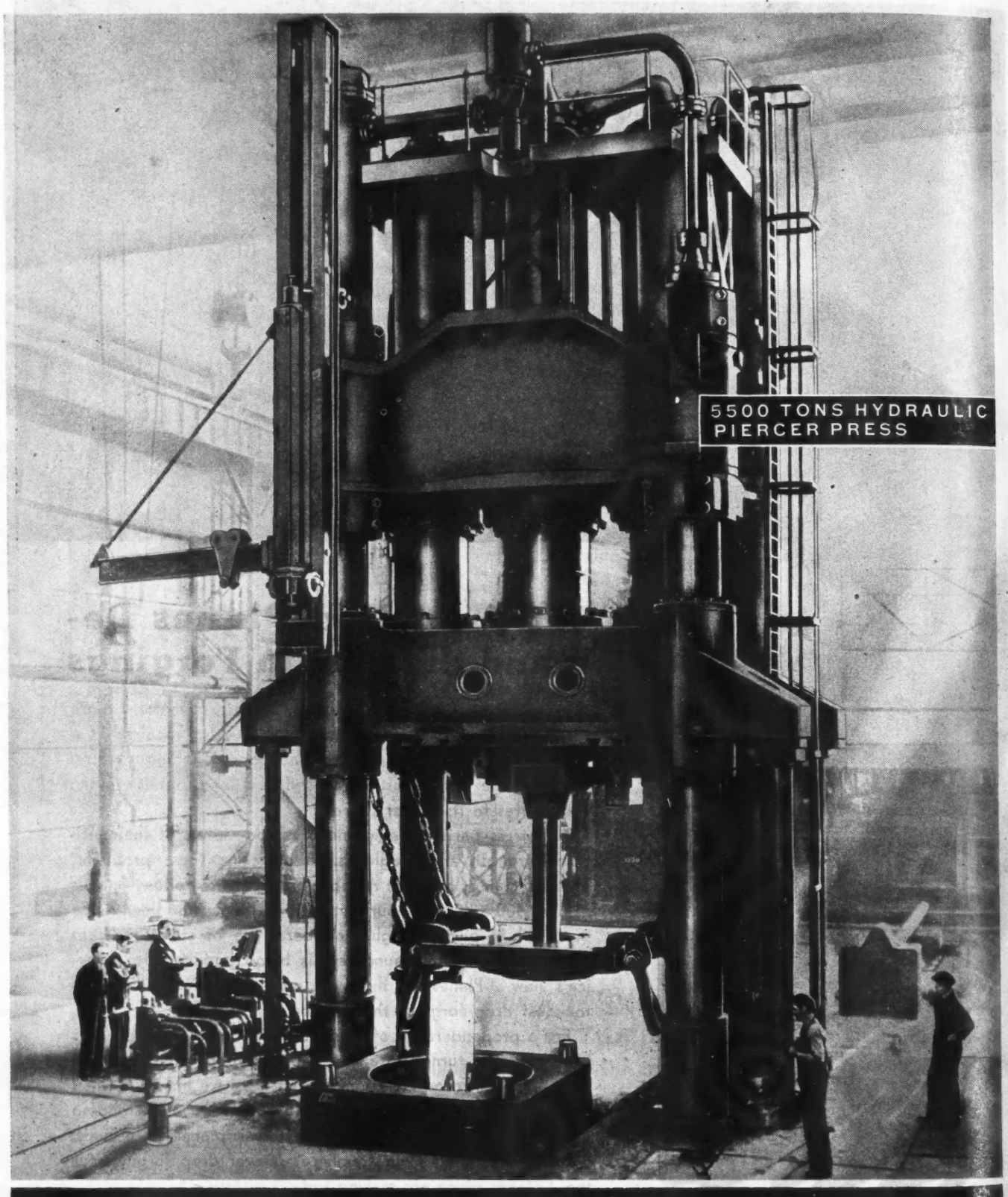
A speed of over 700 miles per hour calls for something more than the power unit that can deliver it. Also required is a plane structurally able to withstand unprecedented stresses, including the terrific thrust imposed as a jet propelled plane accelerates to its fullest speed.

The stress parts of jet planes must be metals at their ultimate strength and toughness. In attacking these problems, plane designers had one reliable precedent to follow. Speeds of over 400 miles per hour for motored planes had been made practical in part through the liberal use of stress resistant forgings. Adequate staunchness is being imparted to America's new J-Planes by the even more extensive use of the toughest drop forgings that can be made.

For a preponderance of these forgings, the J-Plane builders have naturally turned to an experienced specialized manufacturer—Kropp Forge Aviation Division—for we have furnished enormous quantities of tough drop forgings for the outstanding fighters and bombers since the first war planes were built. Now we are turning out tougher-than-ever drop forgings for the J-Planes which are making today's history.

Airplane drop forgings constitute our entire production.

Kropp Forge Aviation Co.
Division of The Kropp Forge Company
5301 W ROOSEVELT ROAD, CHICAGO (50)
Engineering Representatives in Principal Cities
Member of the A.C.C.A.

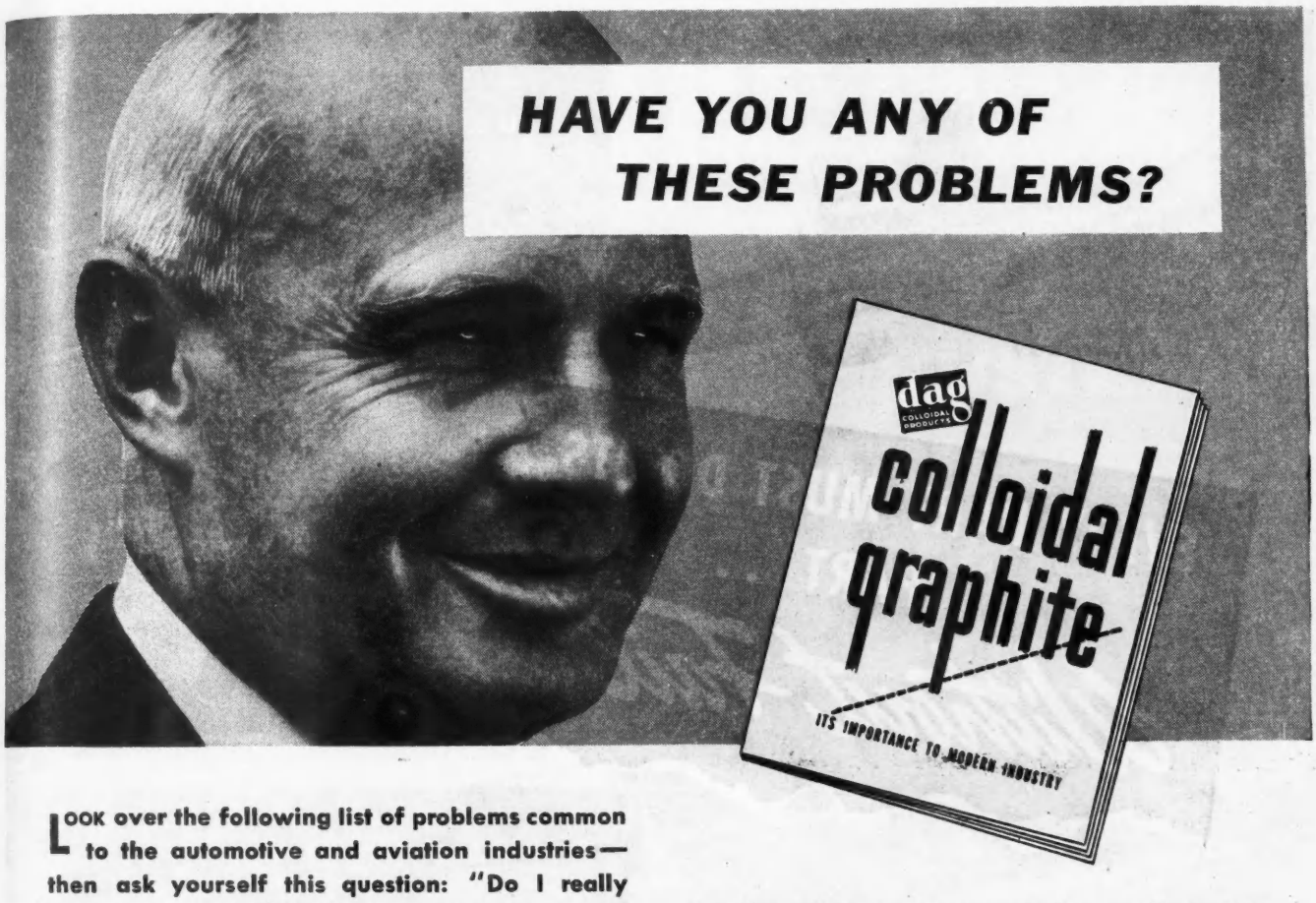


HYDROPRESS · INC.

ENGINEERS CONTRACTORS

HYDRAULIC PRESSES · ROLLING MILLS
STRETCHERS · PUMPS · ACCUMULATORS

570 LEXINGTON AVENUE · NEW YORK · N. Y.



LOOK over the following list of problems common to the automotive and aviation industries—then ask yourself this question: "Do I really know how much "dag" dispersions of colloidal graphite can help to cure headaches like these?"

- Aircraft Instrument Lubrication
- Dry Film Lubrication
- Screw Thread Seizure
- Engine Run-in
- Lubricant for Extruding Aluminum

Use the convenient coupon below and take this opportunity to become better informed about "dag" colloidal graphite. A general booklet (#430) telling the story of the "dag" products and a full set of specific bulletins are available free on request. Acheson Colloids Corporation also maintains a technical staff ready to study your particular problem.

dag colloidal graphite

REG. U.S. PAT. OFF.

ACHESON COLLOIDS CORPORATION, Port Huron, Michigan

TO GET THESE:

This new literature on "dag" colloidal graphite is yours for the asking:

- 430 — A general booklet on the story of "dag" colloidal graphite. 12 pages profusely illustrated.
- 440 — A complete list of "dag" colloidal graphite dispersions with applications.
- 421 — "dag" colloidal graphite for ASSEMBLING AND RUNNING-IN ENGINES AND MACHINERY.
- 422 — "dag" colloidal graphite as a PARTING COMPOUND.
- 423 — "dag" colloidal graphite as a HIGH TEMPERATURE LUBRICANT.
- 431 — "dag" colloidal graphite for IMPREGNATION AND SURFACE COATINGS.
- 432 — "dag" colloidal graphite in the FIELD OF ELECTRONICS.

MAIL THIS: JML Co. A-FI

ACHESON COLLOIDS CORPORATION
PORT HURON, MICHIGAN DEPT. 1-F

Please send me, without obligation, a copy of each of the bulletins checked:

No. 430 ☐ NAME _____
No. 440 ☐ POSITION _____
No. 421 ☐ FIRM _____
No. 422 ☐ ADDRESS _____
No. 423 ☐ ZONE No. _____ STATE _____
No. 431 ☐ OUR PRESENT OIL SUPPLIER IS _____
No. 432 ☐ (Lubricants containing dag colloidal graphite are available from major oil companies.)

RESISTOFLEX flexible compar-tubed hose* is used extensively as fuel, lubricating, instrument and hydraulic lines by leading American and Canadian manufacturers of planes and accessories.

And here's why these vital Resistoflex hose assemblies can be depended upon where the going is tough: (1) They are immune to all types of aviation fuel, lubricating oils and hydraulic fluids, (2) Their inner diameter cannot shrink, (3) They cannot rot, swell or slough off, (4) Vibration, torsion and flexing cannot damage them.

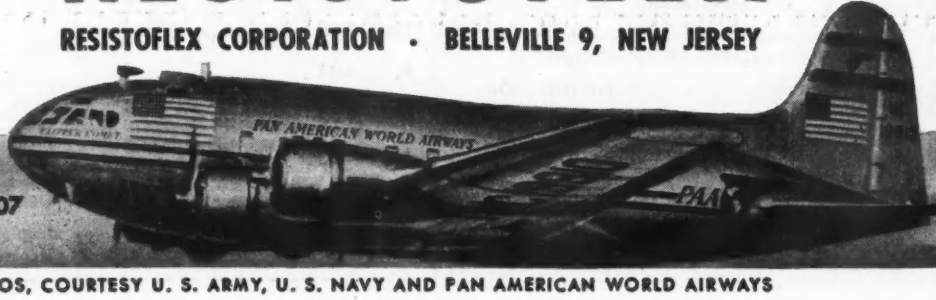
ENGINEERING FACTS:

For complete, detailed information, send for Resistoflex Corporation's Aviation Catalog.

*The tube is the heart of the hose . . . insist upon its being made of compar

RESISTOFLEX

RESISTOFLEX CORPORATION · BELLEVILLE 9, NEW JERSEY

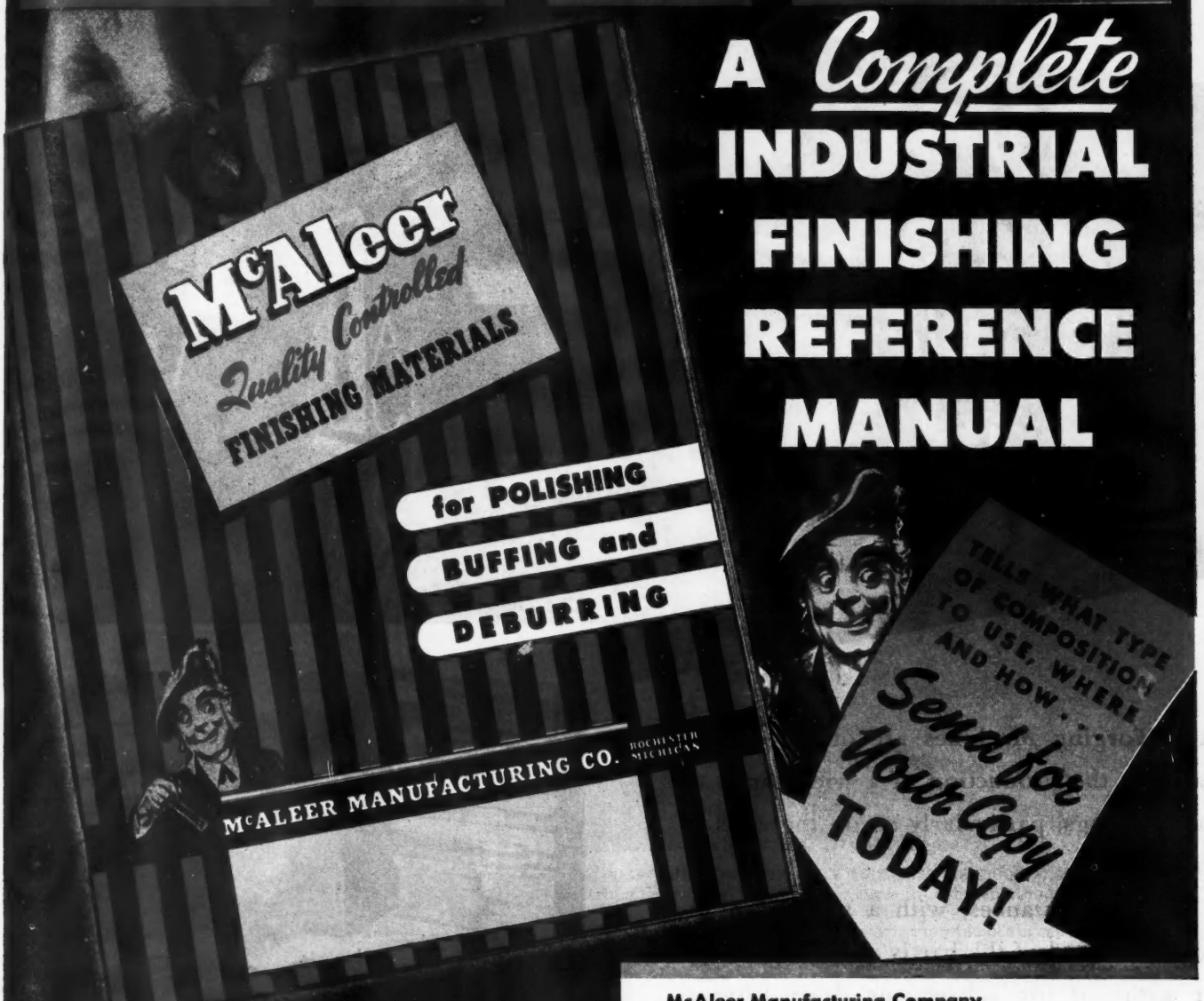


BOEING -307

PHOTOS, COURTESY U. S. ARMY, U. S. NAVY AND PAN AMERICAN WORLD AIRWAYS

JUST OFF THE PRESS!

A *Complete* INDUSTRIAL FINISHING REFERENCE MANUAL



This specially prepared, illustrated industrial finishing catalog on Polishing, Buffing and Deburring, describes McAleer Quality-Controlled Compositions which are scientifically developed to meet the exacting finishing requirements of today and tomorrow.

In addition, it contains valuable reference data on finishing all types of metals, non-metals and plastics. Get your copy while the supply still lasts. Fill in and mail the coupon now.

McAleer Manufacturing Company
Dept. G, Industrial Finishing Div.
Rochester, Michigan

Gentlemen: Please send me as soon as possible a copy of your new Industrial Finishing Catalog.

Name_____

Position or Title_____

Company_____

Address_____

City_____ **Zone**____ **State**_____

McAleer MANUFACTURING CO.

QUALITY-CONTROLLED
Automotive-Household-Industrial
FINISHING MATERIALS

ROCHESTER, MICHIGAN

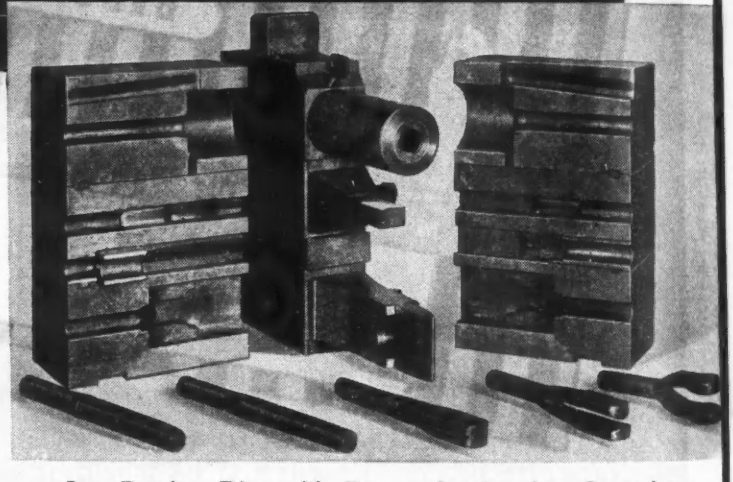
McALEER MANUFACTURING CO., LTD. CHATHAM, ONT.

For Fast Economical Production of Jaw Forgings

Ajax Forging Machines are of exceptional value in the production of a wide range of jaw forgings, particularly so on the ends of long rods.

In some instances, with a small size upsetter, the end of the bar is simply balled up or gathered for subsequent drop forging of the jaw in a hammer or forming in a forging press.

Where the size of the machine is ample and the jaw design suitable, it can be completely forged in the upsetter in dies similar to those illustrated. After gathering, the stock is split by the action of the die slide by closing with suitable splitting knives carried in the gripper die. After that the jaw is brought to finished form by a final upsetting operation.



Jaw Forging Dies with Progressive Forging Operations.

As a third method, where production does not warrant outlay for the somewhat complex dies with slitting knives or where the jaw is large in relation to the size of the forging machine, the slitting operation can be performed on an Ajax Hot Sawing and Burring Machine or with a cutting torch.

Write for Bulletin No. 65-B

The AJAX MANUFACTURING COMPANY
EUCLID BRANCH P. O. CLEVELAND 17, OHIO
621 MARQUETTE BUILDING • CHICAGO 3, ILLINOIS

This RUST Prevention Program may save you $10,000 too!

Manufacturer salvages 12,000 Ballistic Dies . . . protects further production with ANTI-CORRODE

A complete plant rust-prevention program is certain to insure operating economy and accelerate production. Backed by a complete line of tested Anti-Corrodes for every industry, Cities Service engineers are prepared to study *your* rust problems and recommend a specific plan to eliminate them.

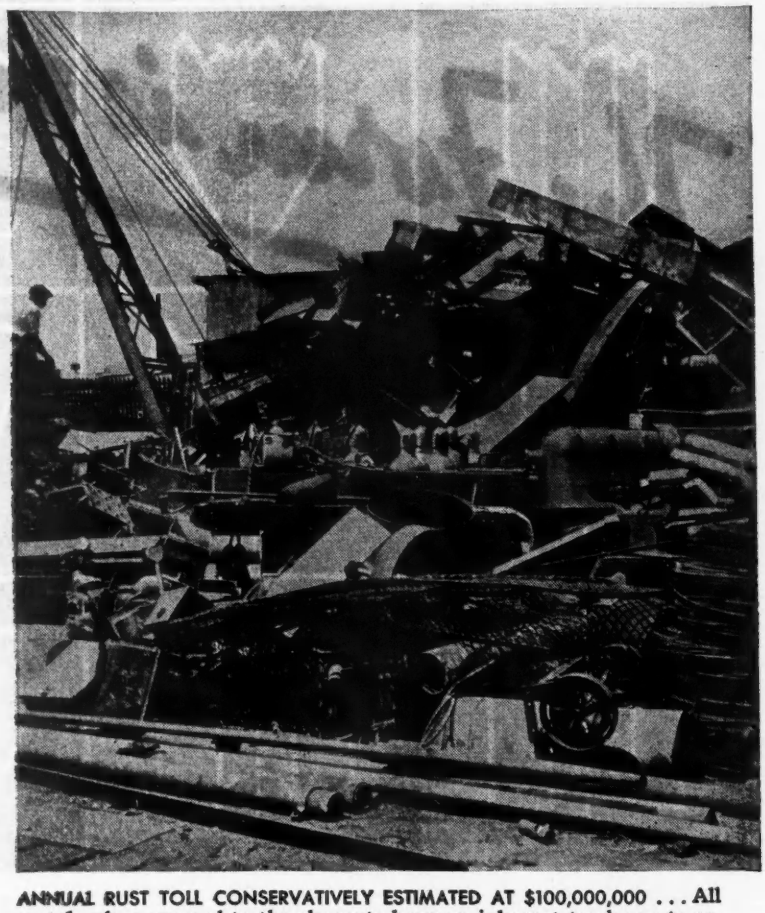
Here's an Example . . .

A Bloomfield, N. J., manufacturer of ballistic dies had a costly problem. After partial completion, his dies were boxed, then shipped to another plant for final treatment. The dies invariably rusted so badly during return transit that they actually would stick together. 12,000 in this condition had accumulated in the plant, representing an investment *in labor alone* of eight to ten thousand dollars.

Cities Service engineers were called in. They supplied a product to clean the defective dies quickly . . . specified a special grade of Cities Service Anti-Corrode to protect them in storage. Three months later the dies were accepted for completion by the final processor. All dies thereafter were immediately dipped in this Anti-Corrode. The rust problem was licked.

Performance records such as this are being chalked up every day by Cities Service engineers in every industry — Mining, Textile, Metal-Working, Construction and others.

See what Cities Service can do for you. Call in our engineers now. Contact your local Cities Service office or mail this coupon.



ANNUAL RUST TOLL CONSERVATIVELY ESTIMATED AT $100,000,000 . . . All metals when exposed to the elements have an inherent tendency to revert to one or another of the forms in which they were originally found in the earth. Iron rust is the most common example of this action. Best safeguard for *your* equipment is a carefully planned and followed Rust-Prevention program.

ANTI-CORRODE safeguard for Industry

CITIES SERVICE OILS — ONCE-ALWAYS — YOUR SYMBOL OF SERVICE

Cities Service Oil Company
Room 324, 70 Pine Street, New York 5, N. Y.

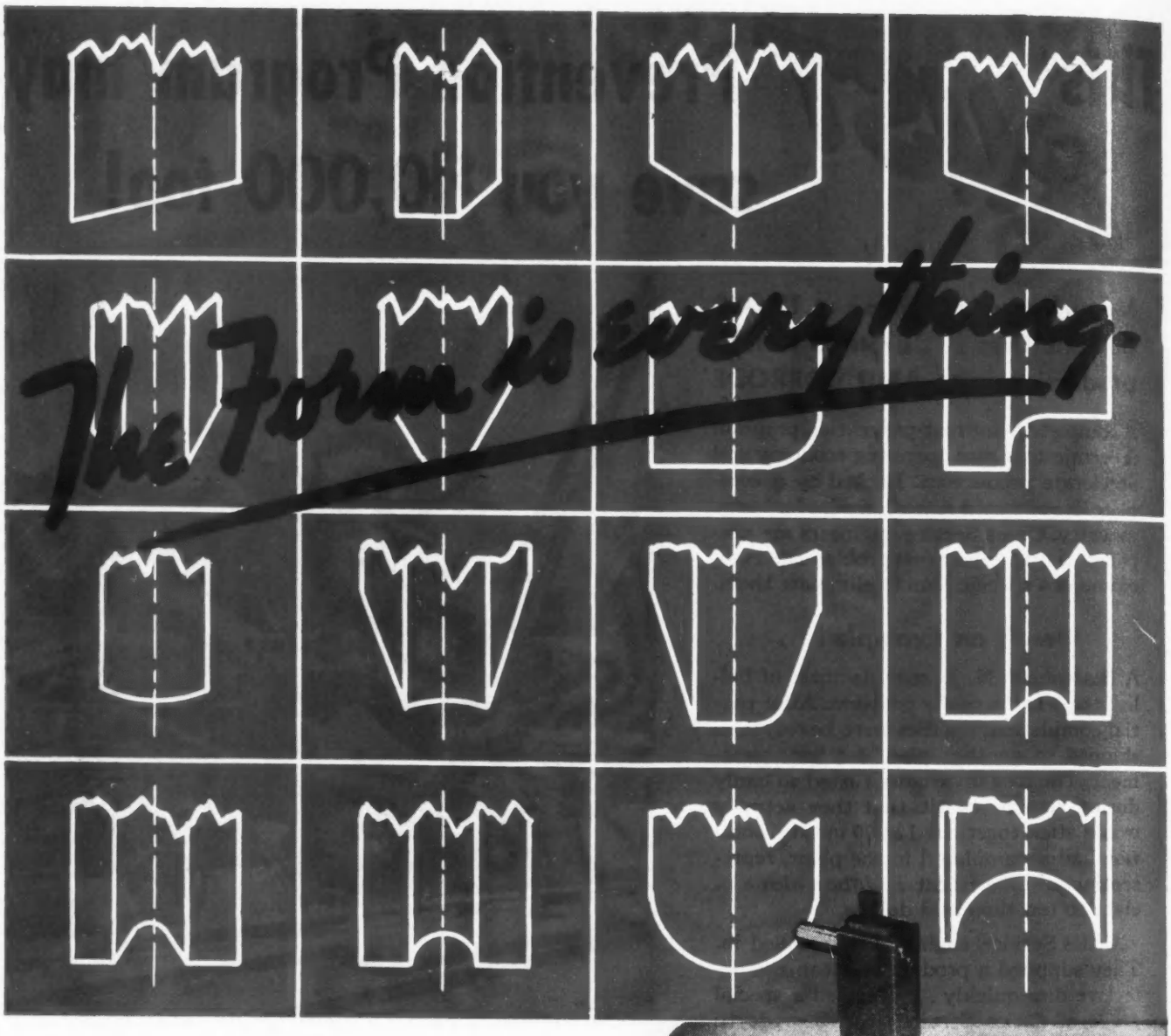
Gentlemen: Please have your engineers discuss with me a program of rust-prevention for our plant. (No obligation, of course.)

Name.....

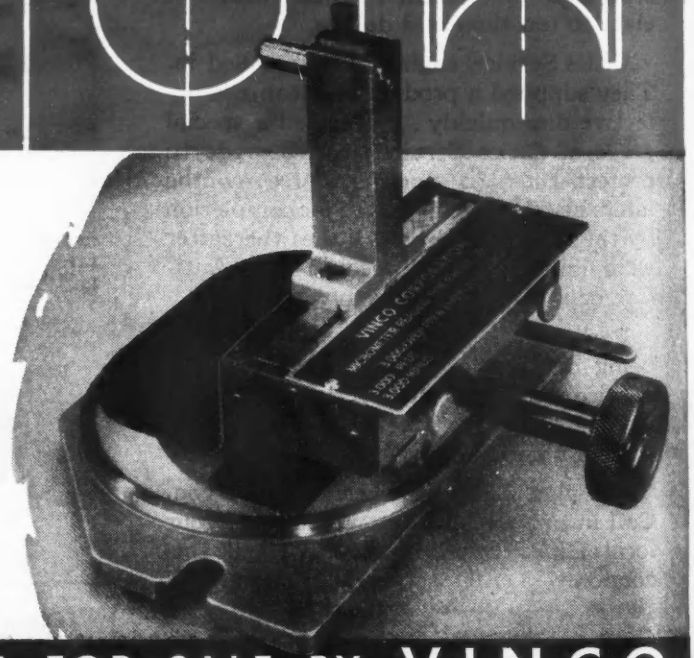
Title..... Company.....

Address.....

City..... State.....



. . . and definitely so when applied to grinding-wheel forms. Dressing and repeating that form within an accuracy of .0001"—simple and rapid conversion to other jobs—eliminating time-wasting adjustments on the diamond post—these are items that can loom large in production costs. Reducing these costs and improving the form dressing is the prime object of the VINCO B-1 DRESSER (angle tangent to radius). Precision built—reliable year-in and year-out, and adaptable to nearly every type of grinder. Write for more detailed information.



MILLIONTHS OF AN INCH FOR SALE BY VINCO

REG. U. S. PAT. OFF.

VINCO CORPORATION, 8869 SCHAEFER HIGHWAY, DETROIT 27, MICHIGAN; SALES OFFICES, NEW YORK, CHICAGO, CLEVELAND

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development.

Marman Universal hose clamps are vibration-proof, too . . . they can stand the "shakes"! Under ALL conditions of operation, they remain tight and securely hold connections. Marman's exclusive swivel-action nut prevents slipping, makes the clamps vibration-proof without safety wiring. That's why so many clamp users are specifying Marman Universal Series 820 hose clamps for leak-proof protection of critical installations.

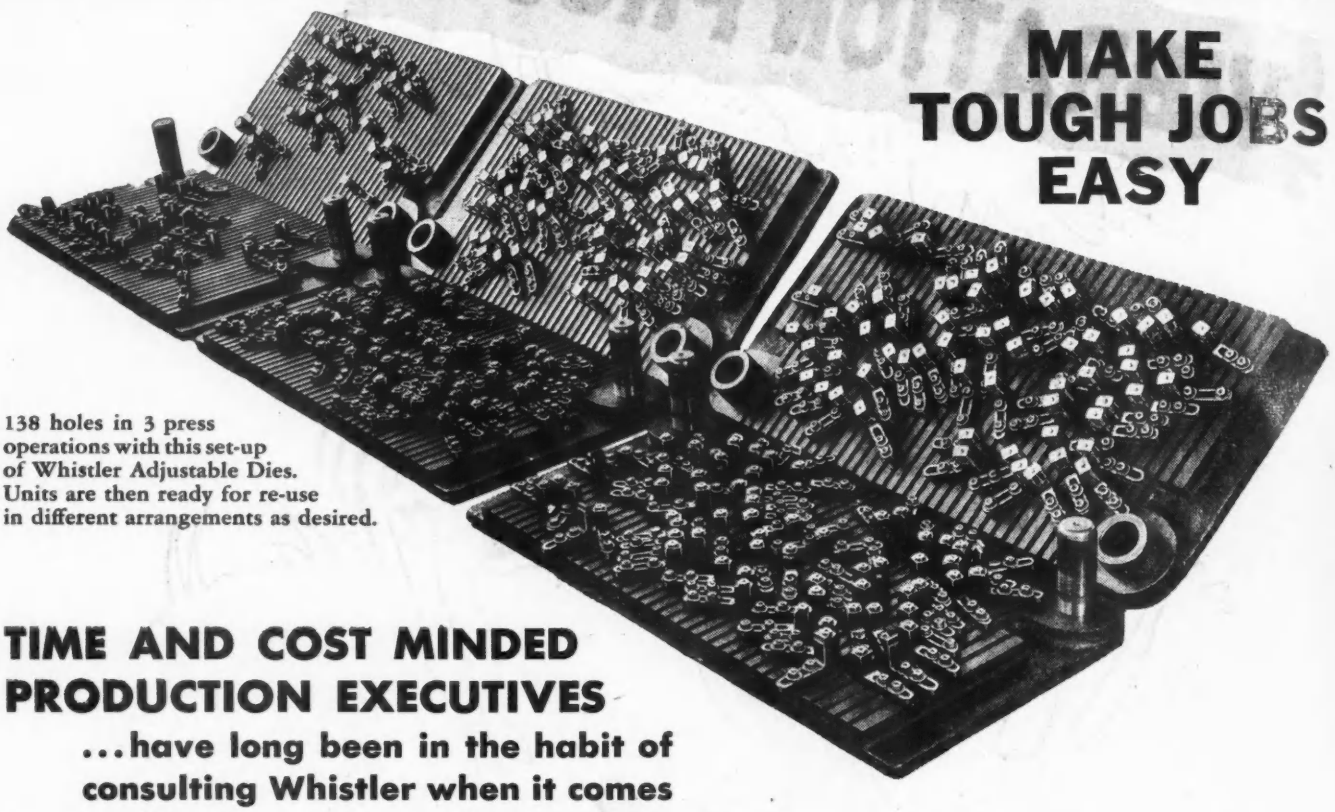
Marman also makes other types of clamps, including the popular Quick-Coupler, in both stainless steel and aluminum alloy, in a complete range of sizes and shapes to fit any convex surface.

High tensile stainless steel band of the Marman Universal opens to permit quick, easy installation and removal. The clamp is corrosion resistant, may be used over and over without efficiency loss. Three sizes handle hose diameters from ¾" to 35" O. D. Write today for new folder Series 820.

MARMAN
PRODUCTS CO. Inc.
940 WEST REDONDO BOULEVARD
INGLEWOOD, CALIFORNIA

WHISTLER PERFORATING—NOTCHING SLOTTING—ROUNDING DIES

MAKE TOUGH JOBS EASY



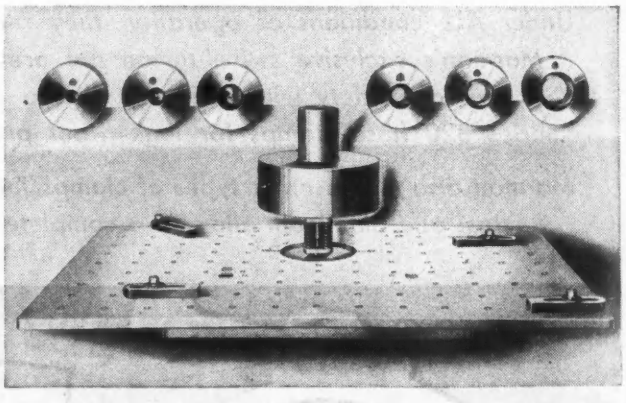
138 holes in 3 press operations with this set-up of Whistler Adjustable Dies. Units are then ready for re-use in different arrangements as desired.

TIME AND COST MINDED PRODUCTION EXECUTIVES

...have long been in the habit of consulting Whistler when it comes to dies for work on sheet metals.

A leading Whistler achievement in reducing die-making and production costs is the multi-use Adjustable Perforating Dies which enable most set-ups to be made from stock units. The Single Hole Perforator, another Whistler development, presents new advantages in quick changes and a wide range of hole sizes. In fact Whistler adjustable dies, group dies, and single purpose dies have contributed greatly to the production achievements of the nation's leaders in practically every line of manufacture. Write for the Whistler catalogs and get the entire story of how to reduce manufacturing costs and get into production faster.

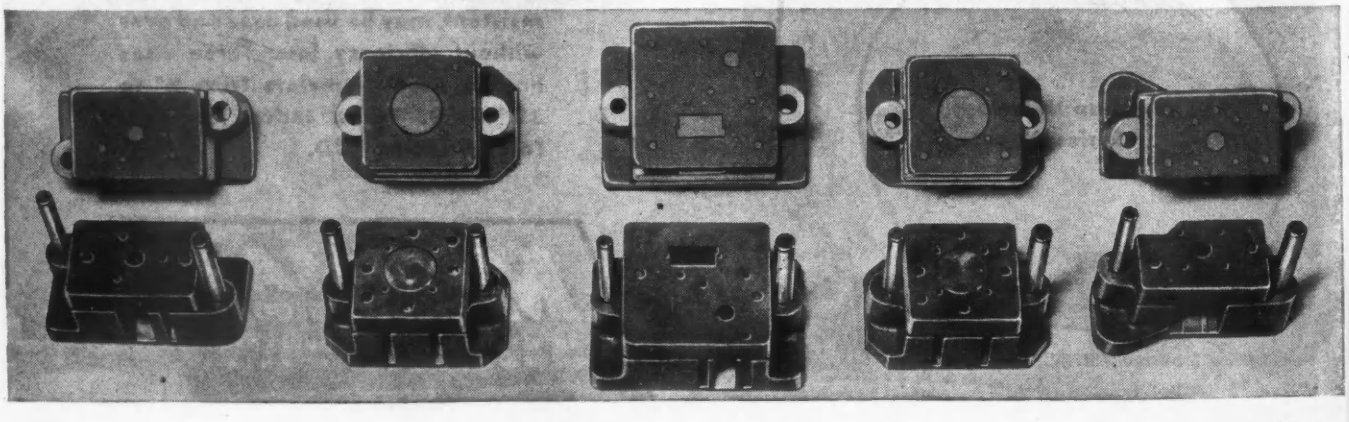
Illustrated below, ready for production, is the Whistler Single Hole Perforator set with punch and die adapter rings for perforating 1/32" to 1 1/2" in mild steel to and including 1/4" thickness when used with Whistler Punches, dies and strippers.



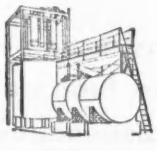
S. B. WHISTLER & SON, INC.

752-756 MILITARY ROAD, BUFFALO 17, NEW YORK

Group dies and special shapes to order. Often used on the press in combination set-ups with Whistler Adjustable Dies.



VISIBILITY UNLIMITED — WITH *Plexiglas*



PLEXIGLAS IS JUST ONE of the many types of products developed by Rohm & Haas research. The varied fields this company serves with a diversified line of chemicals range from aircraft (plastics) to agriculture (insecticides and fungicides), textiles (reducing agents and fabric finishes), enamelware (porcelain opacifiers), and leather (synthetic tanning materials and finishes).

• On today's helicopter, aircraft engineers find another place to put strong, crystal-clear, light-weight PLEXIGLAS to work. Known for its years of service on every type of Army and Navy plane as "aviation's standard transparent plastic," PLEXIGLAS is the logical choice for the nose section of this newest development in the nation's wartime aviation progress.

On the Sikorsky R-5 pictured here, a large one-piece nose of PLEXIGLAS gives the pilot a clear and unrestricted view . . . facilitates rescue work and evacuation of wounded. Weight is saved in two ways: by the elimination of metal framework, and by the lightness-with-strength of PLEXIGLAS itself. R-5 noses of PLEXIGLAS are now being produced on a volume basis by a combination of two fabrication methods—the new vacuum forming technique recently developed by Rohm & Haas, and the older, more familiar stretch forming method.

This use of PLEXIGLAS is one more example of the wide range of possibilities for forming large sheets of this transparent plastic into three-dimensional sections—possibilities having very great significance for postwar automotive applications. For detailed information, telephone or write our Detroit representative: W. E. Biggers, 619 Fisher Building, Madison 1500.

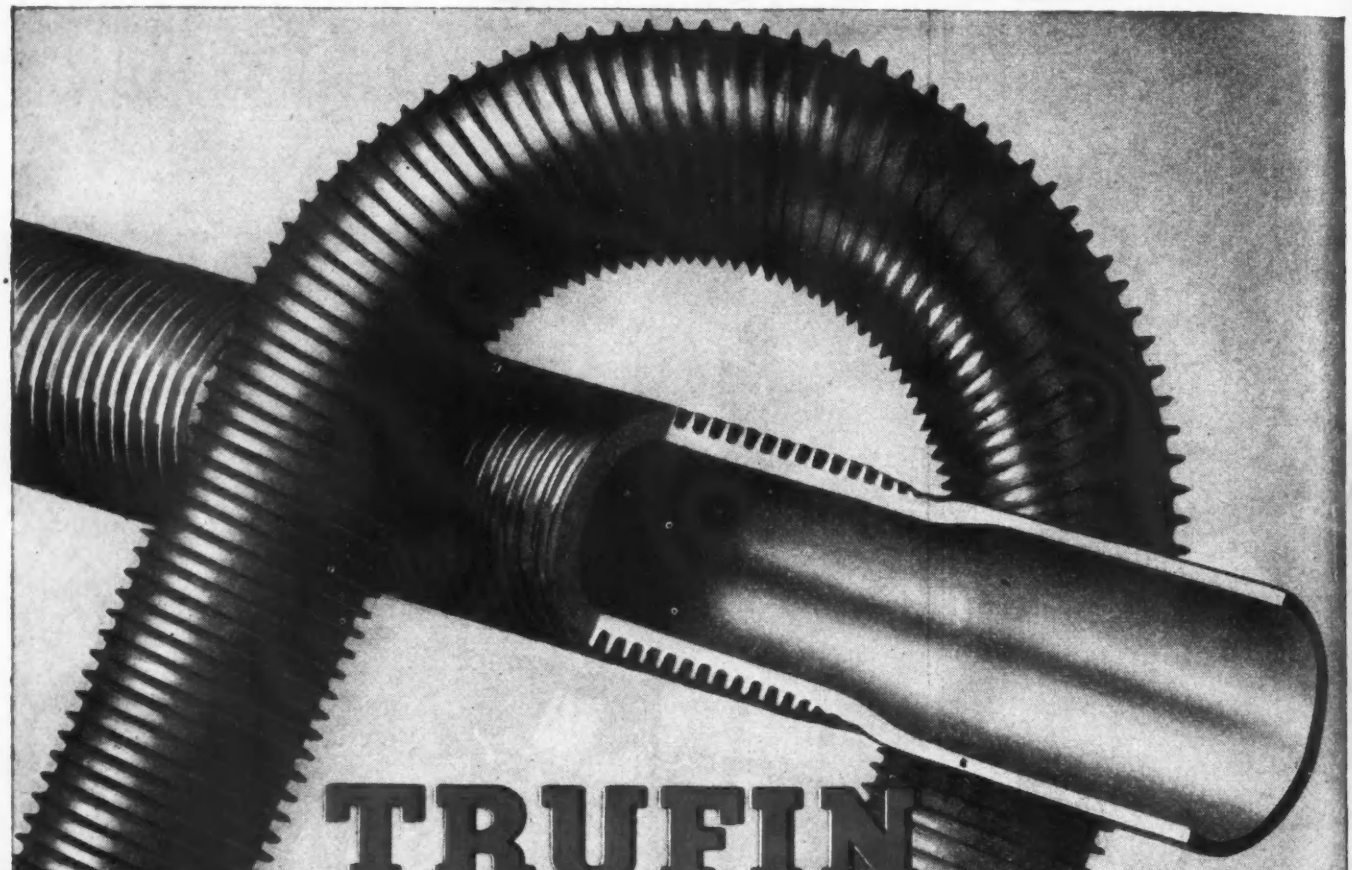
***Only Rohm & Haas makes* PLEXIGLAS**

PLEXIGLAS *is the trade-mark, Reg. U. S. Pat. Off., for the acrylic resin thermoplastic sheets and molding powders manufactured by Rohm & Haas Company.*
Represented by Cia. Rohm y Haas, S.R.L., Carlos Pellegrini 331, Buenos Aires, Argentina, and agents in principal South American cities.

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA, PA.

Manufacturers of Chemicals including Plastics . . . Synthetic Insecticides . . . Fungicides . . . Enzymes . . . Chemicals for the Leather, Textile and other Industries



TRUFIN
WILL BE SPECIFIED

—if you demand non-ferrous finned tubing for condensers or heat exchangers with sturdiness to withstand severe vibration or extreme heat changes.

You'll want TRUFIN because of its unique construction—all one piece. With the fins and tube integral, this finned tube delivers a service of outstanding merit—with economy and dependability.

TRUFIN is available in root diameters, from ⅜" to 1", and with fins of varying heights and spacings. It can be bent, formed, and handled much like plain tubing.

Send for a copy of "Report on TRUFIN" which gives much technical information about the use of finned tube.

WOLVERINE
TUBE DIVISION
CALUMET & HECLA CONSOLIDATED COPPER COMPANY
1411 CENTRAL AVENUE • DETROIT 9, MICHIGAN

BUY
WAR BONDS

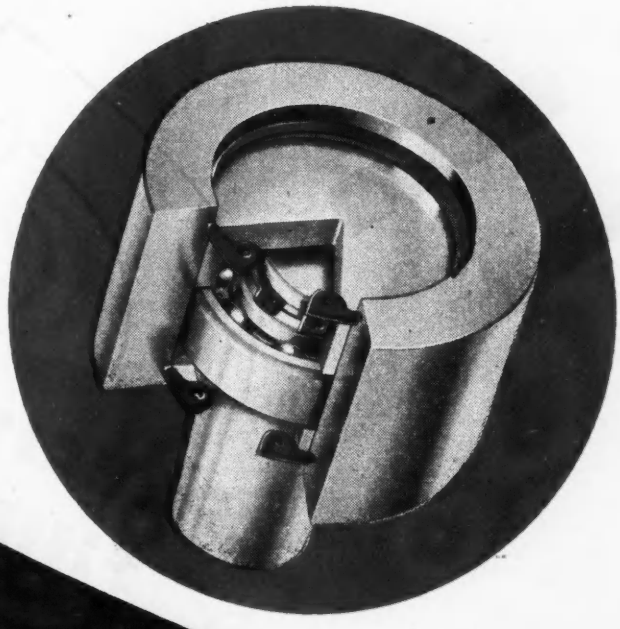
In Canada: UNIFIN TUBE CO., LONDON, ONT.

Waldes

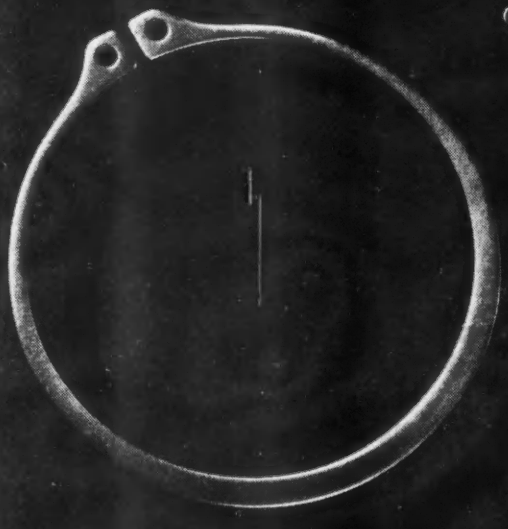
TRUARC

Retaining Ring

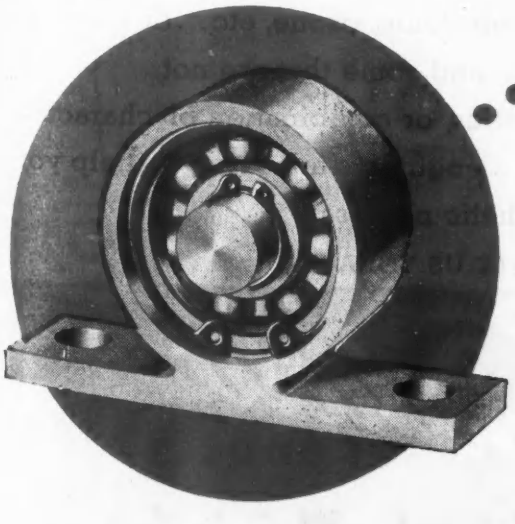
U. S. PAT. RE. 18,144



EXTERNAL TYPE NAS-51



INTERNAL TYPE NAS-50



THE SYMBOL OF QUALITY
WALDES

Waldes Truarc expands or contracts without distortion and without permanent set, fitting tight all around the groove. It offers important advantages over shoulders, nuts, collars, etc., for all thrust-load fixings in shaft and housing applications. It saves space, weight, assembly time and machining costs. Waldes Truarc presents a significant advance in retaining rings, well worth your thorough investigation. We will gladly furnish samples and full data for tests, upon request.

Internal type National Aircraft Standard 50.
External type National Aircraft Standard 51.

WALDES KOH-I-NOOR, INC. Long Island City 1, N. Y.

Canadian Representatives: Prence Progress & Engineering Corporation, Ltd., 72-74 Stafford Street, Toronto

ACADIA *Synthetic*

SHEETS • EXTRUSIONS • MOLDED

Cut, molded or extruded—Acadia Synthetic Products can be processed to the closest tolerance to meet your most exacting requirements—in any shape, size or type of synthetic rubber you need.

Chemically, too, they can be compounded to match specific conditions with emphasis in varying degrees on resistance to air, light, petroleum, ozone, etc...or qualities found in natural rubber—and some that are not.

Tell us the characteristics, or combination of characteristics, you need. Acadia's engineers are ready to help you work out the exact synthetic necessary.

WRITE US TODAY!

ACADIA *Synthetic* **PRODUCTS**

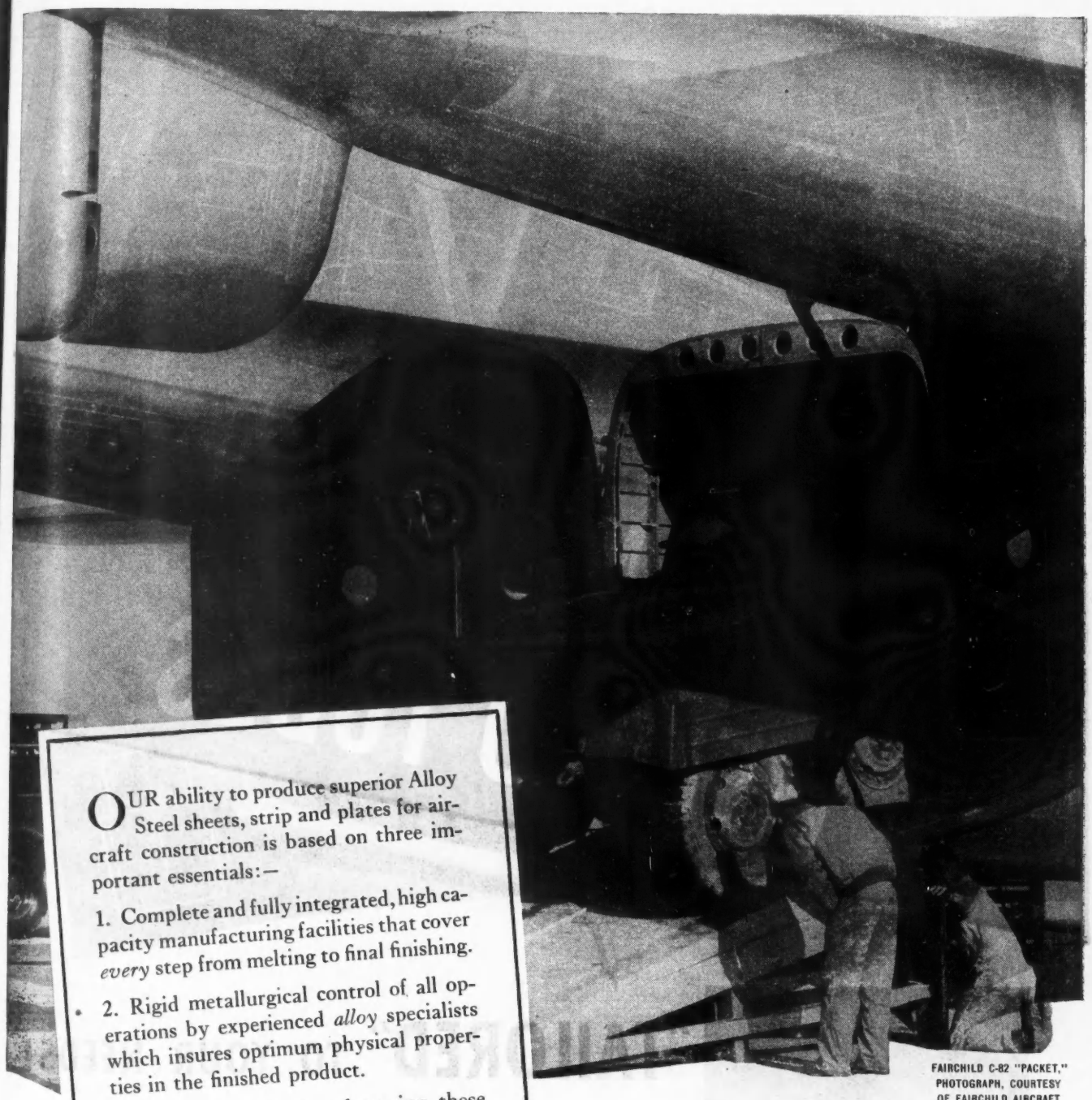
DIVISION OF WESTERN FELT WORKS

Processors of Synthetic Rubber and Plastics • Sheets Extrusions • Molded Parts

DIVISION WESTERN FELT WORKS

LARGEST INDEPENDENT MANUFACTURERS AND CUTTERS OF FELT

4035-4117 Ogden Avenue, Chicago 23, Illinois • Branch Offices in All Principal Cities



FAIRCHILD C-82 "PACKET," PHOTOGRAPH, COURTESY OF FAIRCHILD AIRCRAFT

OUR ability to produce superior Alloy Steel sheets, strip and plates for aircraft construction is based on three important essentials:—

1. Complete and fully integrated, high capacity manufacturing facilities that cover *every* step from melting to final finishing.

2. Rigid metallurgical control of all operations by experienced *alloy* specialists which insures optimum physical properties in the finished product.

3. Equipment for manufacturing these flat-rolled products surpassed by none in the steel industry. It includes the most modern equipment for rolling and bright annealing to meet the exacting standards of surface quality for aircraft applications.

U·S·S CARILLOY
Aircraft Quality
ALLOY STEELS

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago · Offices in Principal Cities

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York

USS STEEL — UNITED STATES STEEL

UNITED STATES STEEL

"TAILORED" TO YOUR NEEDS!

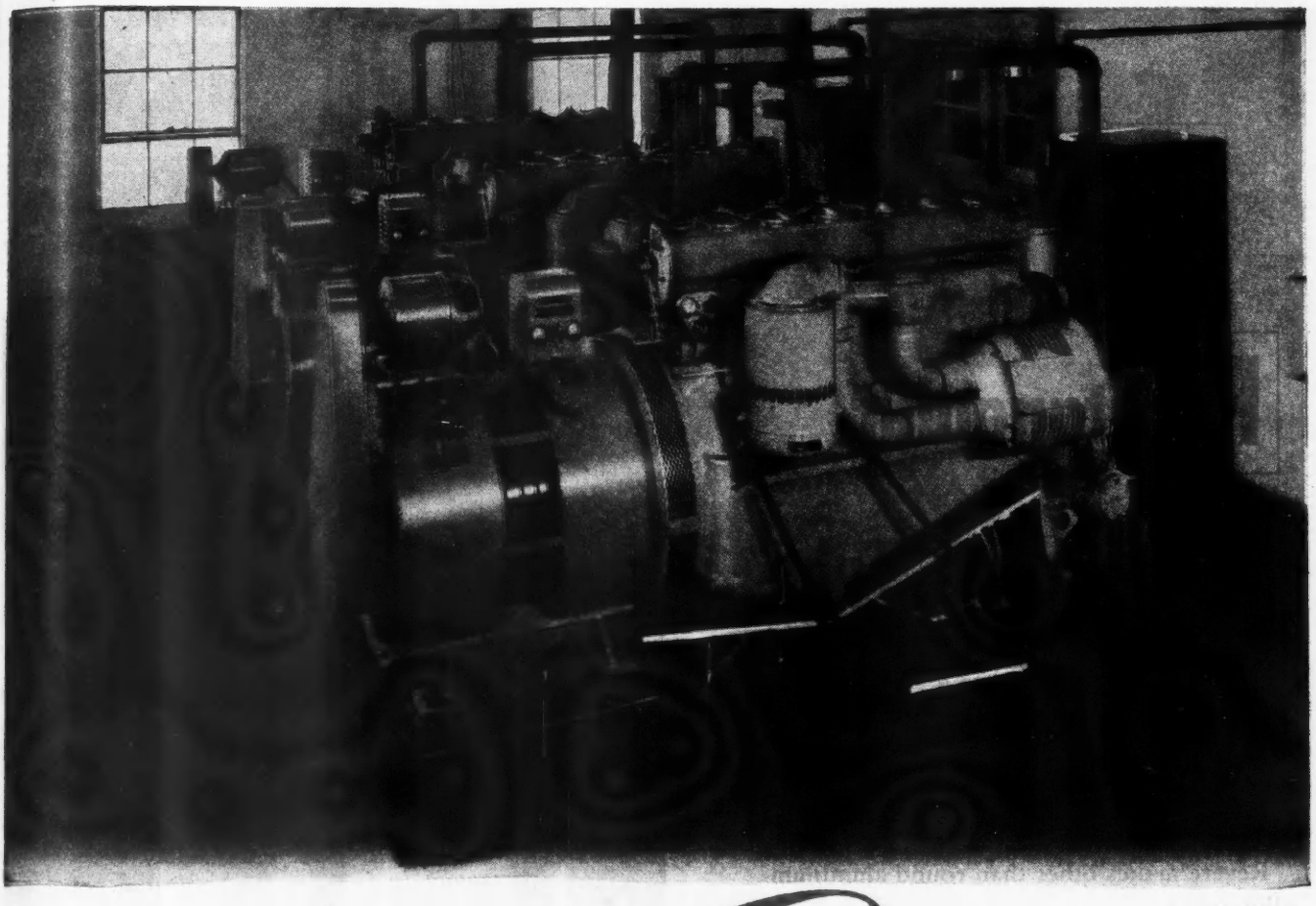
YOU may have design or manufacturing problems for which welded steel tubing is the best answer. Why not call upon our twenty-eight years' experience in this field to help you?

We make electric-resistance welded tubes in outside dimensions up to 5 1/2 inches and with wall thickness up to 5/16-inch. You can forge, upset, swage, expand, form, heat-treat, machine or weld them—*exactly as you need!*

We have the most modern facilities to do all these things in production quantities. Possibly we can save you time, money, and improve the performance of your product.

AMERICAN METAL PRODUCTS COMPANY

5959 Linsdale Avenue, Detroit 4, Michigan



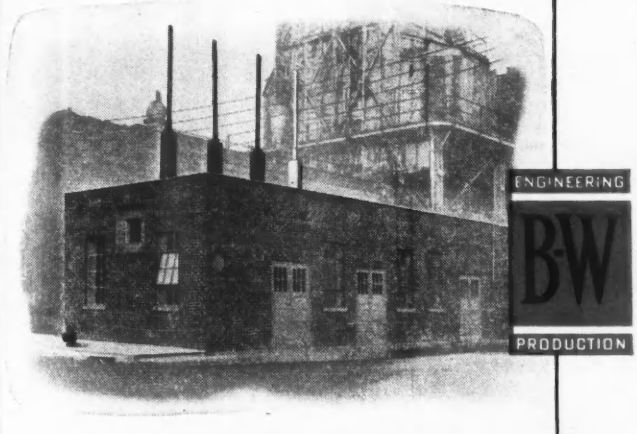
More Power for the Same Space Because of *Supercharging*

Industries bulging with war orders needed more power than the municipal plant at Hartford, Wisconsin could supply.

To meet the problem, Hartford Utilities purchased three Murphy Diesel Generating sets. In order to get the maximum performance and flexibility from the investment and in the space available, these engines were engineered with B-W Superchargers, for a combined capacity of 345 KW.

B-W Supercharging increases engine performance and flexibility without corresponding increase in size because it delivers more air to cylinders than the pumping action of the pistons would normally draw in. More fuel can be burned, and more power developed.

Each passing month furnishes additional evidence of the value of B-W Supercharging for providing more power in a given space . . . to compensate for loss of power at higher altitudes... to improve performance of marine, industrial, transportation, and automotive engines, both gasoline and diesel.



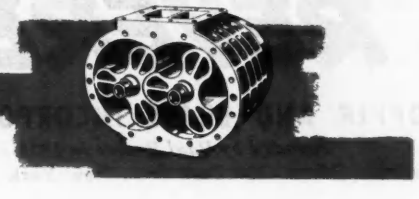
In this corner building, three Murphy Diesels, as shown by the three blackened stacks, occupy only 44 square feet of floor space each, to develop 345 KW.

SUPERCHARGERS, INC.

3406 WEST CAPITOL DRIVE

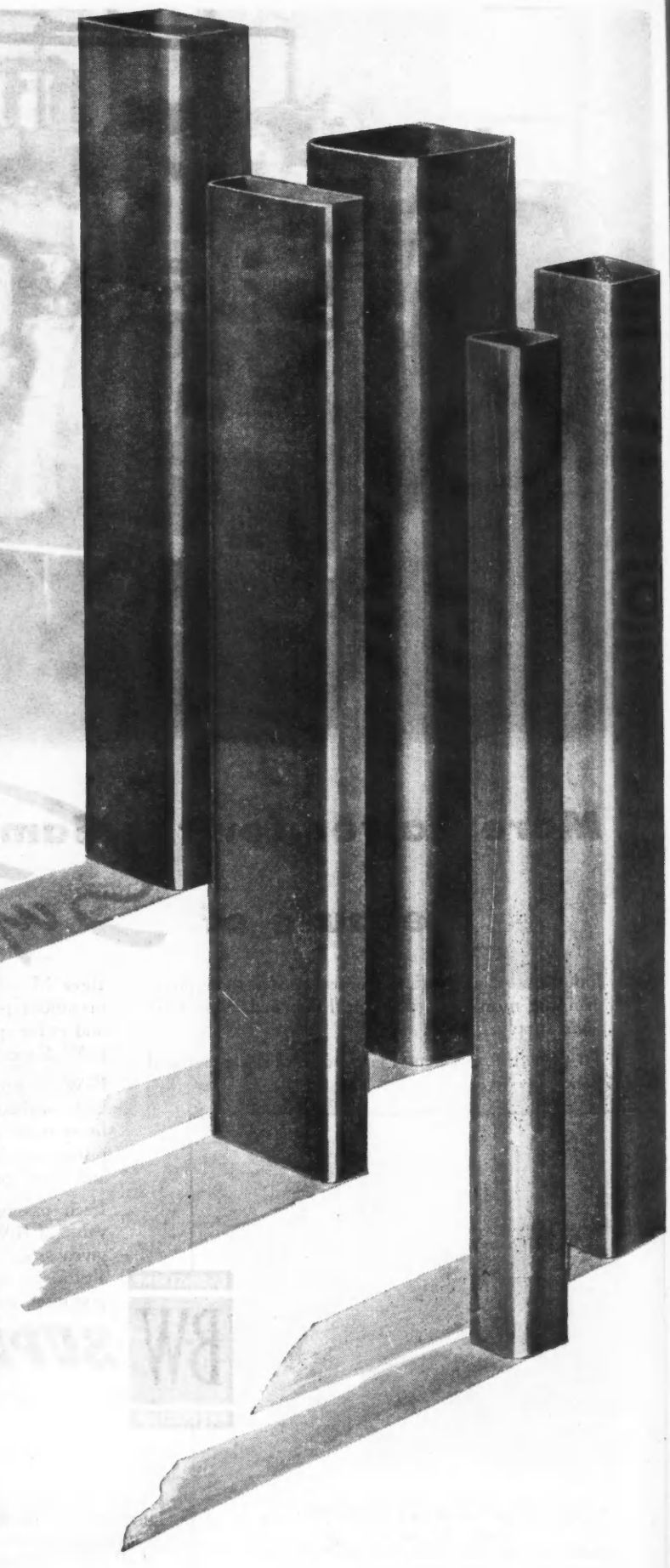
DIVISION OF BORG-WARNER

Milwaukee 9, Wisconsin



B-W Positive Displacement Superchargers supercharge at all speeds and in proportion to the need of the engine for air.

Square and Rectangular Aluminum Tube ...by REVERE



Do you know that —

Revere makes other than round aluminum alloy tubes.

The quality and service established by Revere on round tubes is now available in square and rectangular shapes.

These tubes are now used chiefly in aircraft structural members. They combine lightness with strength and rigidity.

Square and rectangular tubes are drawn from round to provide physical properties that meet specifications for either the S-O (soft) or the S-T (heat-treated) condition.

Dies are available for a wide range of sizes and shapes. New designs may be created to meet new engineering needs.

Eventually, when metal and facilities exceed the needs of war, these tubes will have many important uses in products for civilians. Remember Revere's extensive experience in working aluminum to the most exacting military standards when planning for the future. For full information, write Revere Executive Offices.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

Executive Offices: 230 Park Ave., New York 17, N. Y.

WHAT IS PLUNGE GRINDING OF THREADS WITH CRUSH DRESSED WHEELS?

What are the advantages of ground threads?

Threads can be ground after stock is hardened, eliminating the ill-effects of distortion or surface decarburization from heat treating—especially desirable in the case of tubes and other thin-walled components. Critical thread elements are accurately produced and held concentric with other ground diameters and threaded sections.

How can threads be ground most quickly?

By plunge grinding with a crush dressed multi-ribbed wheel on the Precision Thread and Form Grinder made by the Sheffield Corporation, Dayton 1, Ohio.

What is plunge grinding of threads?

It is the production of a full threaded section equal to the width of a crush dressed multi-ribbed wheel in one quick operation of less than two revolutions of the work.

To what can plunge grinding be compared?

It takes much less time than required with thread hobbing, is far more accurate, and tooling costs are considerably lower.

Is thread plunge grinding fast?

Definitely yes! The wheel is fed into full depth in ⅓ to ½ revolution of the work, and only one additional revolution is required to complete the threaded part. Sections of threads up to 1¼" in length can be quickly produced by plunge grinding on the standard Sheffield Precision Thread and Form Grinder. Special capacity machines are available for other lengths and sizes.

Does plunge grinding produce threads to an accuracy of class 3 fit?

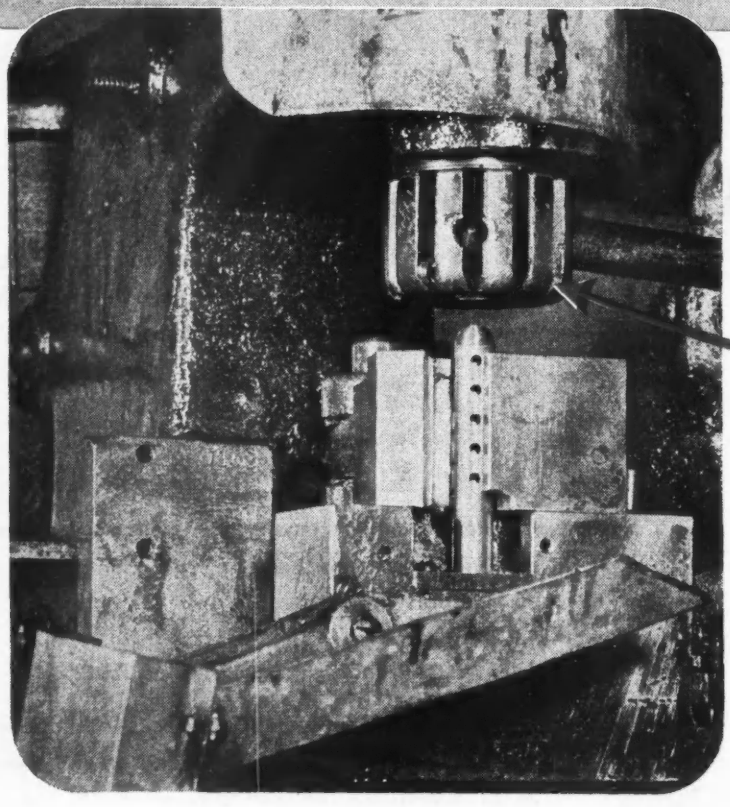
Unusual uniformity of thread angle, lead and pitch diameter is commercially possible with the Sheffield Precision Thread and Form Grinder especially designed for plunge grinding. Thick first and last threads are eliminated in plunge grinding. On this machine, plunge grinding produces commercial work to not less than a Class 3 Fit accuracy in all cases—and to Class 4 Fit in many.

How can more information be obtained on plunge grinding?

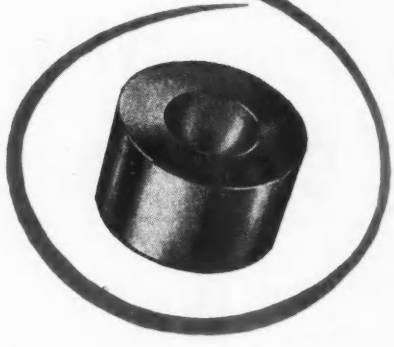
By writing to the Sheffield Corporation, Dayton 1, Ohio.

THE SHEFFIELD CORPORATION • DAYTON 1, OHIO

"HARDSTEEL"



Spinning Dies



Spin Ends Shut on Fuse Cases at the Rate of 720 Per Hour

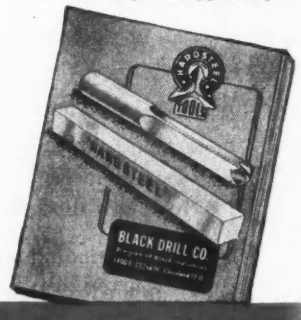
The special properties of "HARDSTEEL"—extreme resistance to wear and heat—are used to good advantage in the high-speed production of fuse cases for artillery and anti-aircraft ammunition. Cases are made of Admiralty bronze tubing, .544" O. D. x .451" I. D. The operation is spinning one end completely shut on a .272" outside radius. This is done on a standard vertical spinning machine at 2000 R. P. M. spindle speed. Case is held by an air-operated holding fixture. No lubricant is used on die or work. Floor-to-floor time is 5 seconds per piece—2 seconds for spinning and 3 seconds for loading and unloading by hand.

The "HARDSTEEL" die averages 48 hours between grinds—regrinding taking about 3 hours. Dies can be ground 15 times before becoming too thin.

"HARDSTEEL" Drills, Tool Bits and Special Tools are solving many other production problems—among them the drilling of hardened steels and the machining of tough hard steels and abrasive non-ferrous alloys. Also inquire about "HARDSTEEL" as a metal for special parts that must meet unusual conditions of service.

LEARN TO DRILL HARDENED STEELS WITHOUT ANNEALING

The "HARDSTEEL" Operators' Manual is free. Write for your copy today.



"HARDSTEEL"

DRILLS • TOOL BITS • SPECIALS

BLACK DRILL CO. • Division of Black Industries • 1400 E. 222nd St., Cleveland 17, Ohio

Other Divisions: Black Boring and Machine Co., Mac-Rod Division

The victory over Germany emphasizes the need of Power to Win to finish the job quickly and completely, concentrating on Japan until our war efforts bring total victory and unconditional surrender. Continental, producer of Power, continues to concentrate on

POWER TO WIN

ARMY E NAVY

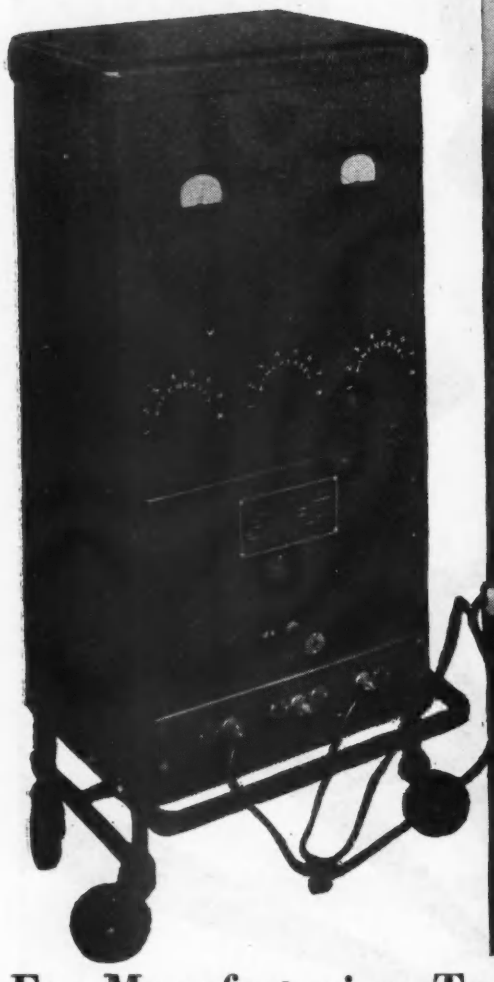
Awarded to the Detroit and Muskegon Plants of Continental Motors for High Achievement

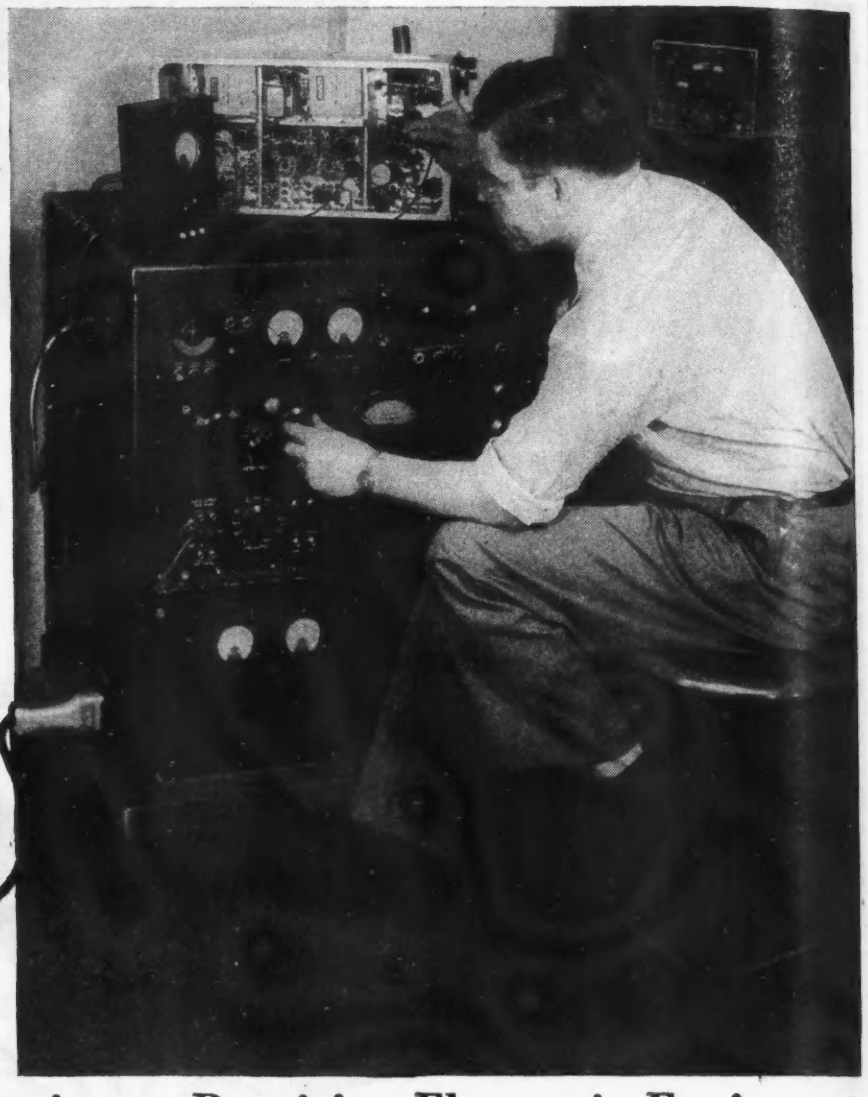
Continental Red Seal Engines

Your Dollars Are Power, Too! Buy War Bonds and Keep Them!

Continental Motors Corporation
MUSKEGON, MICHIGAN

Checking an Ultra High Frequency aircraft receiver with a special testing unit at the Civil Aeronautics Administration Experimental Station. Dependable DC power is provided by this mobile Mallory Rectopower Supply, which can also be used to charge batteries.





For Manufacturing, Testing or Repairing Electronic Equipment

Use a MALLORY Rectopower† Supply

AT THE CAA Experimental Station, Weir Cook Airport, Indianapolis, many types of UHF aircraft radio receivers—including blind landing, marker, radio range and localizer equipment—are tested. All these aircraft receivers operate from 12 or 24 volts DC, supplied by a Mallory Rectopower Supply.

Designed to replace batteries, battery carts or motor generators wherever DC power is required, Rectopower is the most convenient way to assure a dependable source of DC. Rectopowers are designed to operate from any 208 and 230 or 440 volt AC 3 phase 60 cycle outlet.

For manufacturing, testing and repairing electrical and electronic equipment, as well as for taper charging batteries—on assembly lines, in laboratories and maintenance shops—Mallory Rectopower Supplies are favored by engineers. Rectopower units operate silently and give exceptionally long life, because they are equipped with Mallory magnesium-copper sulphide dry disc rectifiers—which have no moving parts.

Ask your nearest Mallory Distributor for further information, or write us today.

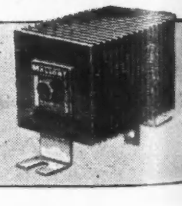
P. R. MALLORY & CO., Inc.,
INDIANAPOLIS 6, INDIANA

†*Rectopower is the registered trademark of P. R. Mallory & Co., Inc., for rectifier power supply units.*

*Rectostarter is the registered trademark of P. R. Mallory & Co., Inc. for rectifier units for use in starting internal combustion engines.

P. R. MALLORY & CO Inc
MALLORY
RECTIFIERS

MAGNESIUM COPPER SULPHIDE RECTIFIERS—
STATIONARY AND PORTABLE D. C. POWER SUPPLIES—
BATTERY CHARGERS AND AVIATION RECTOSTARTERS*



PLEASE EVERYBODY, WITH PLASTIC INTERIORS!

● The entire family of your post war prospect will get a thrill out of the Formica finished interior of your motor car.

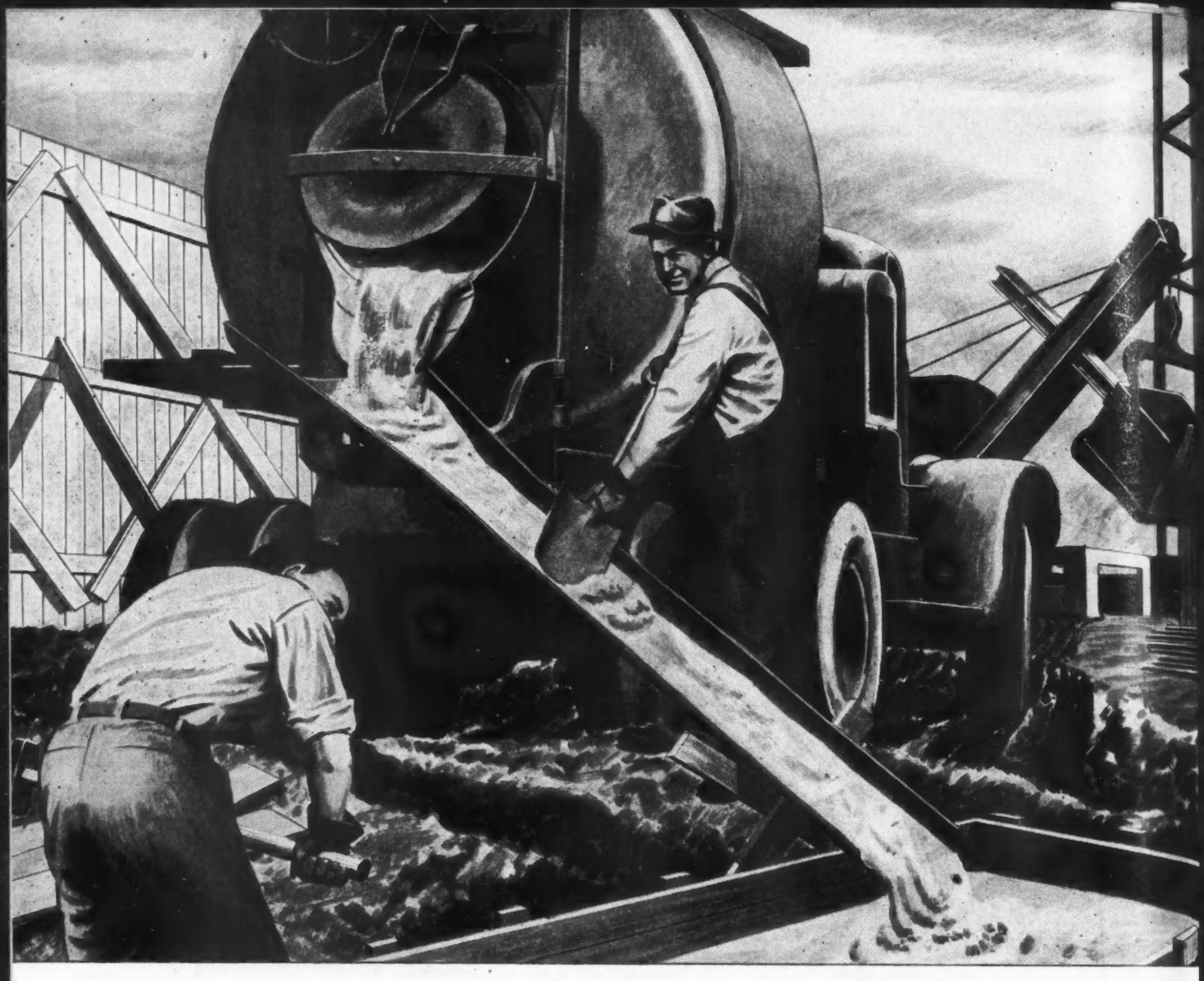
There is color and daintiness to delight the missus; sturdy durability and cleanliness to please the masculine partner, and the children can treat it rough without comebacks.

Almost anything is possible so far as colors and patterns are concerned. The material is hard, non-porous, stain free. It absorbs no grease, no nicotine, and can be washed simply with soap and water or with solvents if that ever becomes necessary.

Furthermore, Formica is light and will subtract rather than add to the weight of the car.

FORMICA

THE FORMICA INSULATION COMPANY, 4612 SPRING GROVE AVENUE, CINCINNATI 32, OHIO



SPEAKING OF POSITIVE CONTROL...

HERE'S A CONCRETE EXAMPLE

By far, the greater majority of the world's most essential transportation moves under the safe, positive, economical control of genuine Bendix-Westinghouse Air Brakes ★ Naturally, your business is different and Bendix-Westinghouse takes this into consideration by engineering a control specifically suited to your exact requirements ★ Years of leadership, plus an organization devoted exclusively to the safety, dependability and economy of the world's foremost motor transport operators and manufacturers, assures you the finest in genuine Bendix-Westinghouse Air Brakes ★ Nationwide, authorized distributors and a competent force of factory representatives are anxious to serve you and your braking problems. This service is maintained strictly in the interest of better, safer, more economical transportation and without obligation ★ Genuine Bendix-Westinghouse Air Brakes cost much less than you'd think! Ask any operator who has ever used this "World Standard of Safety."

Bendix-Westinghouse

AIR BRAKES

AND PNEUMATIC CONTROL DEVICES

IT IS SIGNIFICANT THAT AMERICA'S FINEST MOTOR TRUCK FLEETS ARE EQUIPPED WITH BENDIX-WESTINGHOUSE AIR BRAKE

(Advertisement)

The inside story of the

Sodium-Cooled Valve

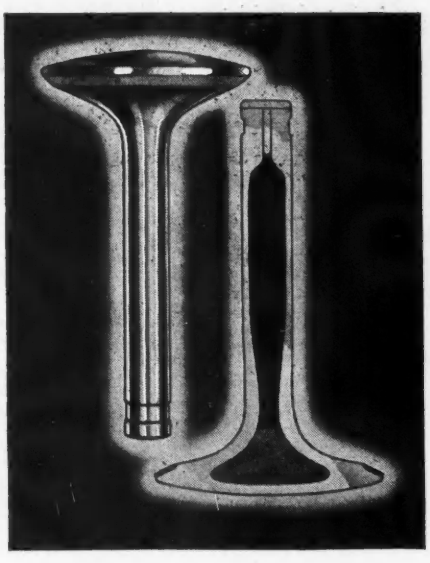
Highlights in development of the valve now universal in aircraft engines of 300 horsepower or more and destined to play an important part in cars and trucks of the future

EVERY now and then an engineering development proves so vitally important, so fundamental, that upon one seemingly small idea the whole progress of an industry may hinge.

Such a development is the Sodium-Cooled Valve, for without it the war planes which today are blasting a victory-trail ahead of our troops might never have been possible.

At the end of World War I it became evident that a radically new type of engine exhaust valve was needed if further strides in increasing output in aircraft engines were to be accomplished. Some of the nation's best engineering talent was put to work with the United States Army Air Corps to concentrate on this problem. Prominent in this experimental work was S. D. Heron, a civilian engineer attached to McCook Field, Dayton. Heron's work led in the direction of a self-cooling valve even though prior experiments in this country and in England with mercury- and water-cooled valves proved unsuccessful.

Inventor Heron, in the course of his experiments, observed that salt baths used in heat-treating operations would readily wet the surface of the pots. This led him to believe that here might be the coolant for which a whole industry was searching.



In operation, the liquefied metallic sodium is agitated by the up-and-down motion of the valve —absorbing heat from the valve head and dissipating it through the valve guide, thence to the cylinder and cooling system.

Filling a hollow-stem valve with a mixture of salts, he made a series of tests under conditions of violent detonation and pre-ignition in the engine. An uncooled valve would have failed completely. But the salt-cooled valve operated "black" instead of red hot, and showed little or no effects from this punishment.

Eaton's Wilcox-Rich Division worked closely with inventor Heron all through this pioneering period. A manufacturing license, granted by the inventor in 1926, was the natural result of this successful collaboration. It was in Eaton's extensive research laboratories that experimentation proved the superiority of metallic sodium (since adopted) to salts as a coolant. And it was there that the Sodium-Cooled Valve, as it is known and used today, was developed commercially.

This is the inside story of the Sodium-Cooled Valve. We at Eaton feel that the contribution made by our engineers two decades ago, plus our mass-production of this complex, precision-made aircraft engine part, give us the right to consider Eaton's aid to the air arm of our military forces as one of the factors contributing in an important way to Victory.

EATON

EATON MANUFACTURING COMPANY • General Offices: CLEVELAND, OHIO

PLANTS: CLEVELAND, DETROIT, SAGINAW, MARSHALL, BATTLE CREEK, LAWTON, VASSAR, MASSILLON, WINDSOR (CANADA)

EATON AIRCRAFT PRODUCTS: PROPELLER SHAFTS • CRANKSHAFTS • ENGINE VALVES • VALVE TAPPETS • COIL SPRINGS • VALVE SEAT INSERTS • GASOLINE TANK CAPS • FLY WEIGHTS • FORGINGS • ENGINE BOLTS • STAMPINGS • BUSHINGS • RETAINER RINGS • WASHERS • AND OTHER MISCELLANEOUS ENGINE PARTS

IT'S IMPORTANT TO YOU

to consider THIS *Cost Factor!*

Frequently, gage quality alone marks the difference between rejection or acceptance of satisfactory parts . . . between production profit or loss.

In the part illustrated, the holes may be extremely close to, but within, required limits. Using an ordinary new gage, in which usual allowance for wear has been incorporated, the "go" member may indicate the hole to be undersize. In a high quality gage . . . made of wear-resistant material . . . wear allowance is eliminated in its manufacture. It is *accurate* from the *first* inspection . . . and throughout its long, dependable service life. If the hole is actually within specified tolerances, it will be gaged correctly and the results of expensive man-hours and machine time will not be consigned to scrap.

This same initial accuracy in a gage . . . this same accuracy which is retained throughout the life of the gage . . . also provides quality control which consistently permits higher standards of precision in production departments. So, from every standpoint, good business judgment dictates the use of only the *best* gages obtainable. Lincoln Park produces them.

ARMY E NAVY

LINCOLN PARK INDUSTRIES, INC.

Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

1727 FERRIS AVENUE • LINCOLN PARK 25, MICHIGAN

When writing to advertisers please mention AUTOMOTIVE *and* AVIATION INDUSTRIES

Strong aluminum alloys, available through Alcoa, cover a wide range of mechanical properties.

Designs of peacetime equipment are already feeling the effects of wartime experience with these high strength alloys. The transportation industry, for example, plans to use them to lower weight, increase speed, reduce power consumption, or get greater payloads.

Data on forming, fabricating and heat-treating these materials are available through Alcoa's engineers. For such information, call our nearest office or write ALUMINUM COMPANY OF AMERICA, 2110 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA ALUMINUM

ALCOA ALUMINUM

MYSTERY of the DISAPPEARING GEAR

Of course it doesn't really disappear. The gear is there all the time—but you'd never know it by measuring the length of the transmission. You can find out exactly how it's done simply by consulting U. S. Patent No. 2,290,821.

Compactness is a virtue in any transmission; in a truck transmission it's doubly important. That's why, in the newer Fuller Transmissions, you'll find an ingenious arrangement that saves the shaft space—the over-all length—otherwise required for the reverse gear.

Even though an inch or two of length and fifty-odd pounds of weight may be unimportant in your particular plans, they are significant of an engineering approach and ability which assures the outstanding quality of the Fuller Transmission of Tomorrow. And that is important to you, whether you design, build, or use heavy duty trucks.

FULLER MANUFACTURING COMPANY, KALAMAZOO 13F, MICHIGAN
Transmission Division
Unit Drop Forge Division, Milwaukee 1, Wisconsin

GEAR GRIND

FORMED WHEEL *Grinding*

FOR ALL TYPES OF PRODUCTION

The first formed wheel grinding of splined shafts occurred in the fall of 1909, when The GEAR GRINDING MACHINE COMPANY delivered a thousand shafts and transmissions to Hudson Motor Company.

During the following 36 years the Formed Wheel Method of grinding has been refined, perfected and applied to many types of production. By grinding after hardening, distortion due to heat treatment is eliminated.

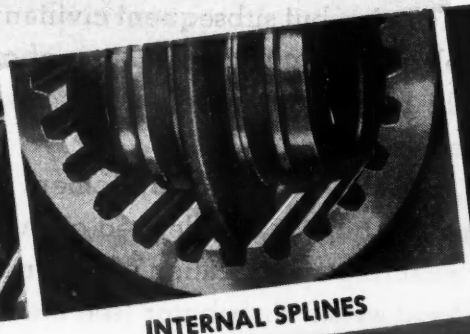
Standard GEARGRIND Machines offer you accuracy—production—superb finish—over a wide range. Special machines can be designed to perform special grinding operations.

The GEARGRIND catalog covers all types of machines, as well as our contract grinding service for experimental or production jobs.

EXTERNAL GEARS

INTERNAL GEARS

EXTERNAL SPLINES



INTERNAL SPLINES

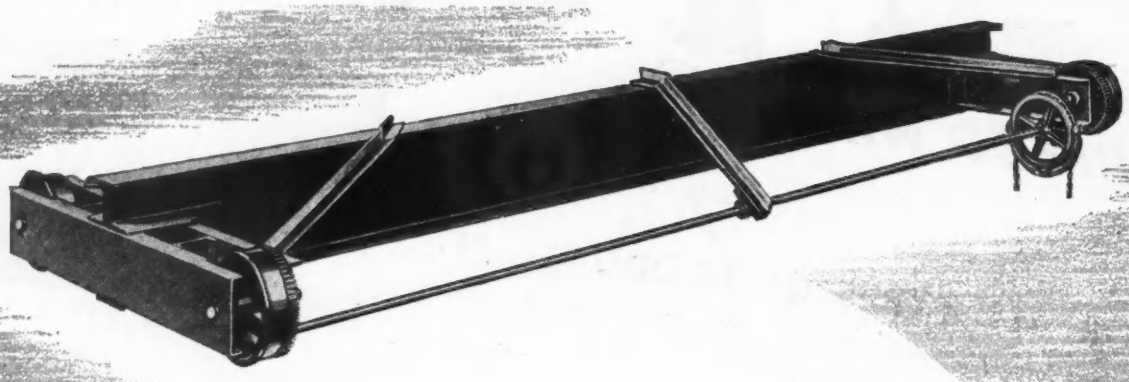
RACKS

ARMY E NAVY

Manufacturer of
RZEPPA
Constant Velocity Universal Joints

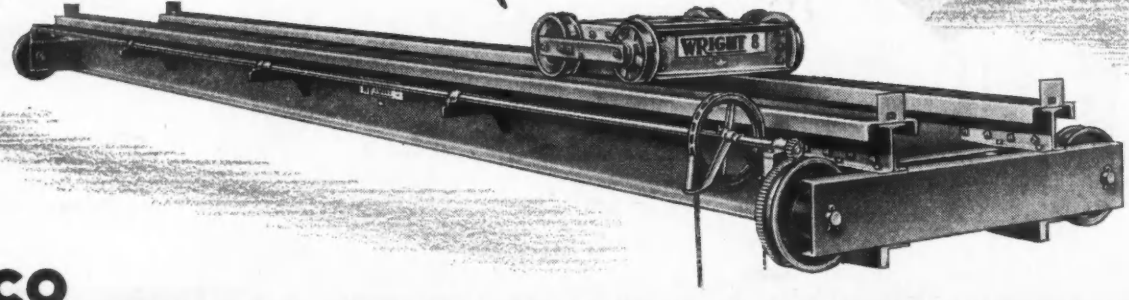
GEARGRIND SG-12
Straight spline grinding machine. Takes up to 60" between centers.

WRIGHT CRANES



THINK what an overhead traveling crane, with a WRIGHT HOIST and TROLLEY, could do—when it comes to moving machinery around, or in and out, in that reconversion job that is just ahead. A WRIGHT TRAVELING CRANE would really put your ceiling to work, and speed up not only reconversion but subsequent civilian goods production as well. The WRIGHT combination of crane and hoist would help bring your production costs down to competitive levels.

WRIGHT material handling equipment (cranes, hoists and trolleys) is built in any desired capacity and to meet the most exacting specification. If your problem is special, ask local WRIGHT distributor (see metropolitan classified telephone directory) to call in a WRIGHT engineer. In the meantime, write for WRIGHT Specification Bulletin, or Catalog 12-D.



ACCO

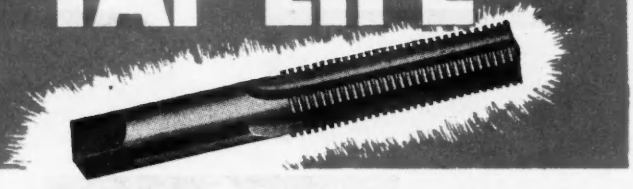
York, Pa., Chicago, Denver, Los Angeles, San Francisco, Portland, New York, Bridgeport, Conn.

WRIGHT MANUFACTURING DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

In Business for Your Safety

over 500% increase in TAP LIFE



by Sub-Zero Treating in a *Deepfreeze* Industrial Chilling Machine

Sub-zero Treating Increased Production from 2,000 to 12,000 Tapped Holes per Sharpening and Greatly Reduced Machine Down-Time

Here is an example of how Cold Treating increased the productivity and efficiency of *one type* of metal cutting tool. This large Midwestern manufacturer taps 6 holes in cast-iron automotive brake cylinder blocks with a 5/16" tap.

Prior to Cold Treating, production averaged was 2,000 holes per tap sharpening. This required changing taps after the completion of approximately 300 blocks, resulting in excessive machine down-time. Some method had to be found to increase tap life and lessen it.

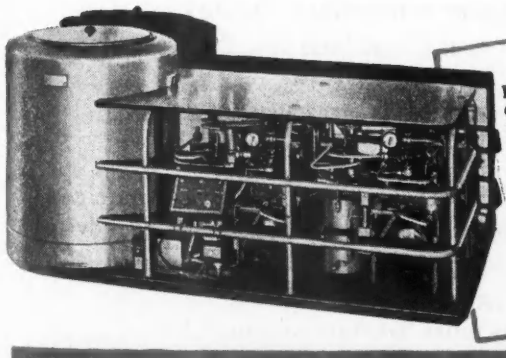
Cold Treating in a Deepfreeze Industrial Chilling Machine solved the problem. By subjecting these taps to sub-zero temperatures of −120° F., tap life was increased from 2,000 to 12,000 holes per tap sharpening—a total productive increase of over 500%. This increase greatly minimized machine down-time. Instead of changing taps every 300 blocks, now from 1,500 to 1,800 blocks are tapped before a change is required.

How Cold Treating Increases Performance Life of Tools

Rapid wear of the conventionally heat-treated taps indicated sub-zero treatment as a possible remedy. Sub-zero treatment at −120° F. gave a structure possessing an improved combination of hardness and toughness, resulting in increased cutting efficiency and lengthened tool life.

Cold Treating Has Numerous Applications

Cold Treating is not restricted to cutting tools. It is also applied with outstanding results to other types of tools and parts where increased hardness and uniformity of structure are demanded for maximum efficiency. It provides the only practical solution of stabilizing gauges and precision parts where a high degree of stabilization is required. It reduces costs and increases production on shrink-fit assembly. It is being widely used for testing materials and numerous miscellaneous applications.



JOB FACTS

Part—Cast-iron Cylinder Brake Block.
Operation—Tap 6 holes.
Machine—Huskins Tapping Machine.
Tool—5/16" Wood and Spencer Tap.
Tap Life Before Cold Treating—2,000 holes per sharpening.
Cold Treating Medium—Deepfreeze −120° F. Industrial Chilling Machine.
Tap Life After Cold Treating—12,000 to 15,000 per sharpening.
Remarks—From 10,000 to 13,000 more holes tapped per sharpening; machine down-time greatly reduced.

FREE...*Here's Cold Treating Information You Need*

To completely understand the underlying principles of cold treating and to determine how and to what extent it can be applied to your production, write for this valuable 40-page bulletin. It gives you concise, factual data on Cold Treating from its inception to the present time. Complete with tested procedures, field test reports and specifications of Deepfreeze Industrial Chilling Machines—this book merits a place in your technical data file. Write today for your free copy of Bulletin I-4.

Only Motor Products can make a "DEEPFREEZE"

Deepfreeze

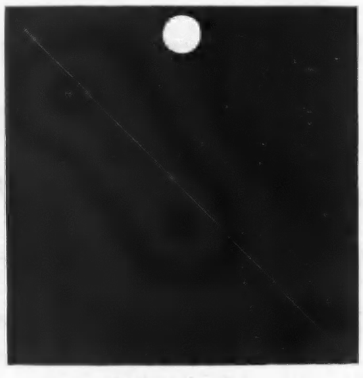
2314-6 DAVIS STREET,
NORTH CHICAGO, ILLINOIS

TRADE MARK DEEPFREEZE REGISTERED UNITED STATES PATENT OFFICE

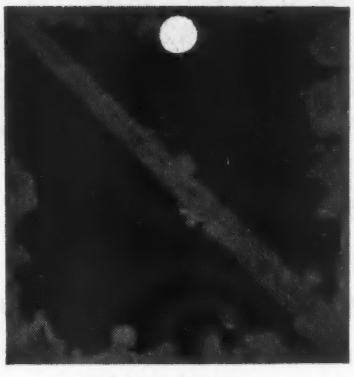
Industrial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

DIVISION OF
MOTOR PRODUCTS CORPORATION
DETROIT, MICHIGAN

Peroline
PREVENTS RUST
PROPERLY CONDITIONS FOR PAINTING



Painted after Peroline Protection



Painted after Conventional Oil Coating

Both of these panels were vapor degreased and painted with High Bake Black Fender Enamel and exposed to Salt Spray. Note lack of paint failure at the diagonal scratch and at the edges of PEROLINE coated panel.

These photographs are positive evidence of PEROLINE'S merit. You can duplicate the demonstration in your own laboratory.

PEROLINE

- **provides better rust protection for parts in transit, fabrication and storage.**
- **removes light blushes of rust and marks from sweaty hands—destroys or neutralizes chemicals that would develop rust under conventional oil coatings.**
- **produces a properly conditioned surface for durable paint finish when the oil phase is removed from the work with solvents or in a vapor degreaser.**
- **makes it possible to safely use a vapor degreaser in preparation for a durable paint finish.**

PEROLINE, if applied to a clean surface, keeps it clean and leaves it properly prepared for finishing with no other treatment than to remove the oil phase by vapor degreasing or with suitable solvents or thinners.

The Technical Department of the American Chemical Paint Company will also gladly advise you regarding proper chemicals for your use in rust removing and metal cleaning both for war products and those for domestic use.

Send for PEROLINE *literature Department K-6.*

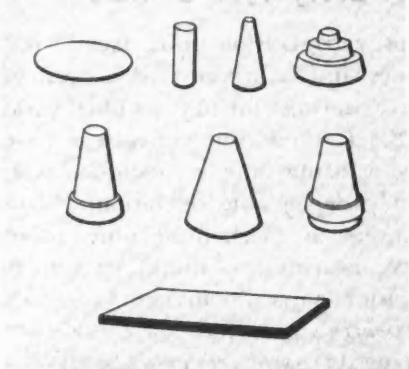
MANUFACTURERS OF INHIBITORS AND METAL WORKING CHEMICALS

AMERICAN CHEMICAL PAINT CO.

AMBLER ACP PENNA.

Note—West Coast Plants may address inquiries and orders for prompt delivery to Leon Finch, Ltd., 728 East 59th St., Los Angeles, California.

*MORAINE POROUS METAL



MPM elements for filtration, separation, diffusion, flow control, flame arresters.

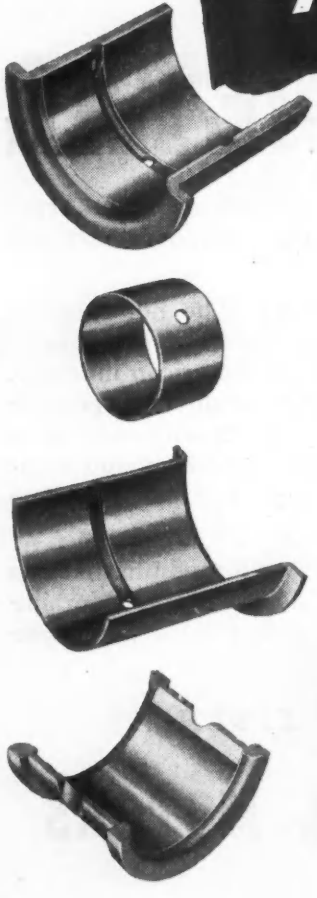
Whether the application is a household refrigerator or an Army tank, a fighter plane or a civilian automobile—*precision parts* are the heart of performance.

But *attaining* precision is only half the story. The other half is *maintaining* it under operating conditions—and here Moraine Porous Metal filter elements have a lot to offer American industry. Designed into the application, this unique product of powder metallurgy uniformly filters out harmful particles down to .0005 inch—provides a tortuous flow passage that traps, impinges and stops dirt—safeguards close-fitting parts, polished surfaces and fine orifices against abrasion and clogging.

If your products or processes involve a flowing medium that has contact with precision parts, you should investigate Moraine Porous Metal. Our engineers will work with you to determine the most efficient grade, size, shape.

WAR BONDS SAVE LIVES

MORAINE PRODUCTS DIVISION OF **GENERAL MOTORS**
DAYTON, OHIO



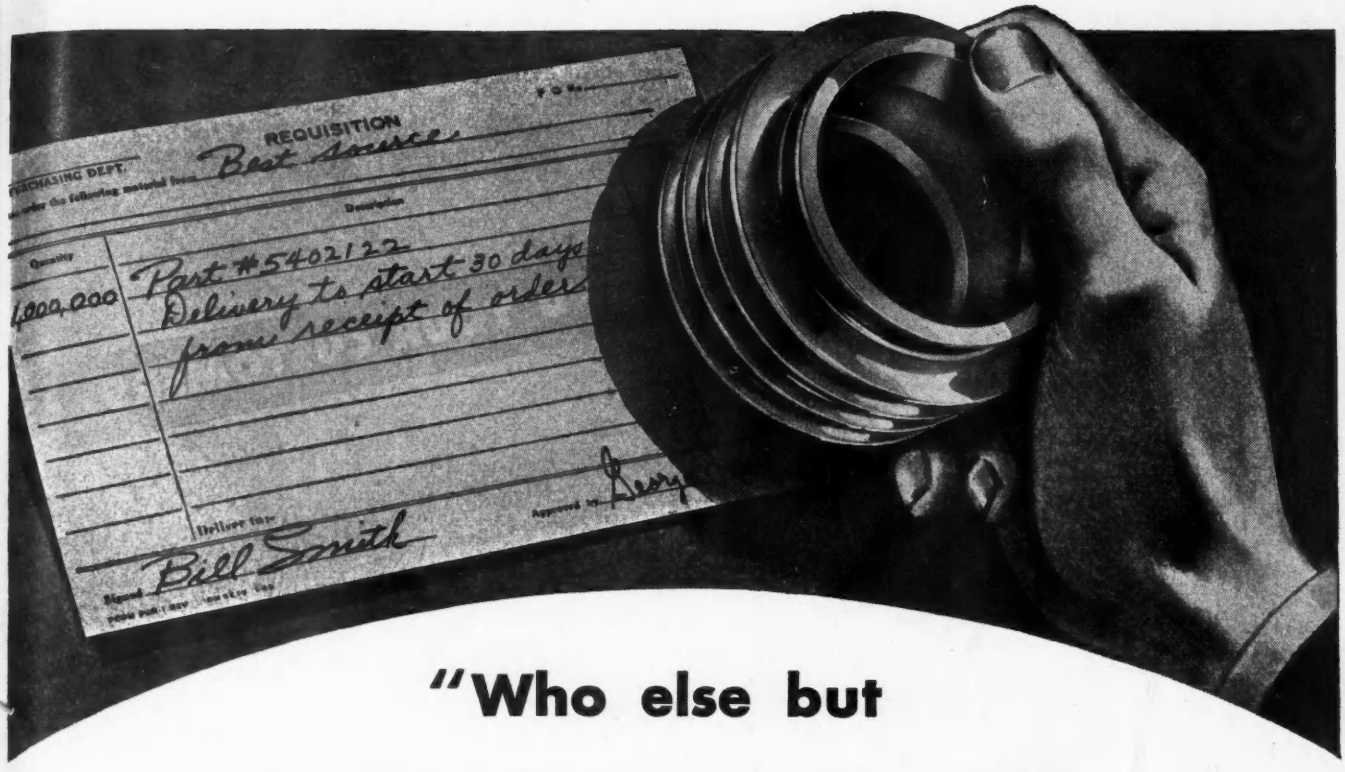
"Down on the Farm" Federal-Mogul Sleeve Bearings Demonstrated Their Efficiency for Every Type of Service

Since the beginning of the automotive industry, Federal-Mogul has been equipping farmers' cars, trucks, tractors, pumps and compressors with *silent* sleeve bearings. Skillful design and precision manufacture have been combined to produce dependable operation under every condition of farm service. Federal-Mogul brought similar dependability to the engines of planes, ships, refrigeration units, factory machines—in fact, wherever shafts turn in sleeve bearings, for 46 years FEDERAL-MOGUL *silent* sleeve bearings have been assuring quieter, smoother, completely dependable operation. Manufacturers of mechanical units using sleeve bearings, bushings or similar precision parts are invited to consult us. *Bearing specialists since 1899—operating six completely equipped plants.*

FEDERAL-MOGUL CORPORATION, DETROIT 13, MICHIGAN

FEDERAL-MOGUL

Silent FEDERAL Mogul **SLEEVE BEARINGS**

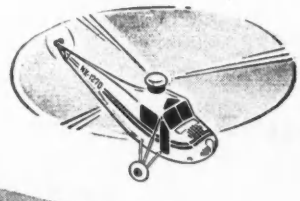


"Who else but *Aeronautical Products* could turn out a part like this, in volume?"

LET today's planning be that Peace will come tomorrow! Overnight you must be ready to stop working for the few and begin to meet the demands of the many. What will you have to sell? New products . . . new designs for old . . . test models on which to form your production pattern . . . new parts for mass civilian production? Then, *it's a job for Aeronautical Products!*

API is the story of a vigorous American enterprise that became a production giant . . . proof that engineering brains, skilled workmen and precision machinery can work wonders. » » » » Two great plants tooled to perfection . . . poised and ready to serve you *completely.* Write our Executive Sales Office for plant equipment facilities . . . be ready *when the day comes!*

BUY WAR BONDS



● *Make ownership of a safe, sturdy Aeronautical Products Helicopter a "must" in your personal postwar plan. You'll find you can afford one!*

AERONAUTICAL PRODUCTS, Inc.

DETROIT PLANT
and Administrative Offices:
18100 Ryan Road, Detroit 12

API

OHIO PLANT:
Washington Court House
Ohio

Something New in Rest for You

. . . AND YOUR CUSTOMERS

HEWITT RESTFOAM

WHEREVER YOU SIT . . . WHEREVER YOU SLEEP

Yes, Restfoam is a wonderful new development in the field of latex foam . . . promising great advantages in comfort for travel of the future.

WHEREVER YOU SIT: in your home . . . in your car or your office; in train or plane; in lobby or lounge . . . you may enjoy the marvelous comfort of soft, resilient cushions of Restfoam.

WHEREVER YOU SLEEP: at home or hotel; in modern train or sleeper plane; chances are you will *sleep* on Restfoam . . . with unmatched comfort.

Restfoam is COOL . . . ventilated by millions of tiny interlaced air cells that breathe and circulate air freely.

Restfoam is FIRM . . . does not lose its shape nor pack down . . . yet it is soft, springy, and resilient.

Restfoam is LIGHT in weight.

Restfoam is odorless and vermin-proof. It may be washed, scrubbed, or sterilized.

For comforts to come, remember the *name* . . . "RESTFOAM—something new in *rest* for you . . . and your customers." *Hewitt Rubber Corporation, 240 Kensington Avenue, Buffalo 5, New York.*

HEWITT RUBBER *of Buffalo*

QUALITY RUBBER PRODUCTS FOR INDUSTRY FOR 85 YEARS

To serve the automotive industry in the development of RESTFOAM products for postwar needs, Hewitt Rubber Corporation has appointed GEORGE P. HOOPER, 919 Fisher Building, Detroit 2, Mich.

© 1945 HEWITT RUBBER CORPORATION, BUFFALO, N. Y.

FOR DEPENDABILITY AND UNIFORMITY

DISSTON

STANDARD ALLOY STEEL

(Including National Emergency Steel Compositions)

AIRCRAFT QUALITY for Airplane Parts

GUN QUALITY for Gun Barrels, Rifle and Torpedo Parts

TOOL STEELS for Cutting, Blanking and Forming

You can always be sure of a sound, clean product when it is made of any of these fine Disston Steels. They represent the latest developments in metallurgy and engineering, and have behind them the wide experience of the first company in America to produce electric tool steel of crucible quality.

Each of these highly specialized Disston Steels is made of carefully selected ingredients . . . by modern steel practice . . . in electric furnaces . . . under automatic control. You can count on them, at all times, for thorough dependability and uniformity.

ESTABLISHED 1840

REG. U.S. PAT. OFF.

Disston Engineers will be glad to help you with your postwar plans

In working out your postwar plans, the choice of the right steels may be a factor of major importance. This has been true with a large number of manufacturers, many of whom have profited from consultation with Disston engineers and metallurgists.

This valuable service is also available to you. You may feel free to submit your steel problems to Disston, knowing that your communication will be held in strictest confidence. You will be advised frankly, and without obligation. When writing, please give full details.

HENRY DISSTON & SONS, INC., 631 Tacony, Philadelphia 35, Pa., U. S. A.

HOW THE WORLD'S LARGEST, FASTEST, TWIN-ENGINED TRANSPORT *Counts its Calories*

Bowser XACTO Meters Precision-Check Fuel Flow and Consumption for Today's Great Lifeliner, Tomorrow's Great Airliner

They call it the Burma Road of the Air because three-quarters of all the vital war supplies, flown over the towering Himalayas into China, have been transported in the Curtiss Commando.

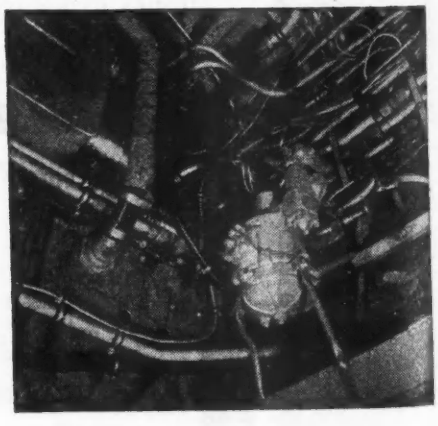
Little wonder that this mighty twin-engined transport is known as today's great lifeliner, tomorrow's great airliner.

And less wonder that Curtiss-Wright selected Bowser Xacto Meters for testing fuel flow and consumption, gross weights, and center of gravity locations for stability and control for the Curtiss Commando.

Carrying vital cargos of war-winning materiel and personnel over thousands of air miles demands that those vital calculations be measured with hairline accuracy because lives . . . American lives and thousands of them . . . hang in that exacting balance.

Your liquid control problems may not involve lives or battles. But if they do involve costs, production and profits . . . if they call for precision-measurement and control . . . Bowser can make a real contribution.

Bowser Meters, Filters, Proportioners, Lubricating Systems, Pumps, and other liquid control units daily are proving themselves indispensable in every phase of industry. If you wish a Bowser liquid control specialist will analyze your job with you . . . without obligation, of course. BOWSER, INC., Dept. 31-F, Fort Wayne 2, Ind.



The Bowser XACTO Meter Installation on the Curtiss Commando

BOWSER

SINCE 1885

Not only has Bowser's war production earned the Army-Navy E . . . Bowser equipment has helped earn it for scores of other companies.

THE NAME THAT MEANS EXACT CONTROL OF LIQUIDS

NOW...Broaden Your Duplicating Scope!

• Here is the quick, easy way to duplicate tracings, line drawings, specifications, black and white prints, Van Dyke negatives or blue prints! The Bruning Model 2 BW—Copyflex Continuous Printer fits into desk-top space—yet gives you the advantages of *continuous* photographic-process production. Do not confuse this Bruning Printer with the less efficient "copy box" type. Used with three trays and a simple drier (readily available), the Model 2 produces Copyflex prints. At the flick of a switch, the Model 2 becomes a BW Printer for producing easy-to-read Black and White Prints—and these prints are developed with an inexpensive BW developing machine. Get all the facts about the versatile Model 2 Continuous Printer—mail the coupon for full information!

CHARLES BRUNING COMPANY, INC.

Since 1897

NEW YORK	CHICAGO		LOS ANGELES
Atlanta	Boston	Detroit	Houston
Kansas City	Milwaukee	Newark	Pittsburgh
St. Louis	San Francisco	Seattle	

CHARLES BRUNING COMPANY, INC.,
4702-8 Montrose Avenue, Chicago 41, Illinois

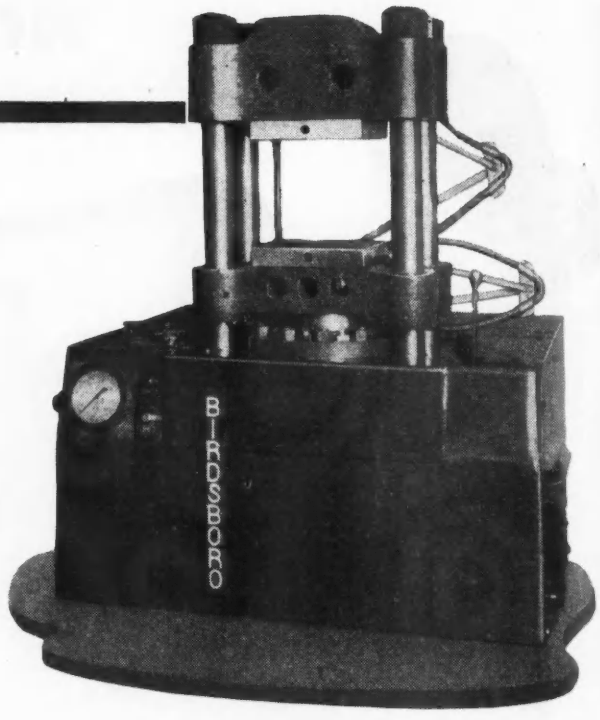
Please send me complete information on your Model 2 BW—Copyflex Continuous Printer—and on other Bruning printing and developing machines for making Bruning Black and White Prints.

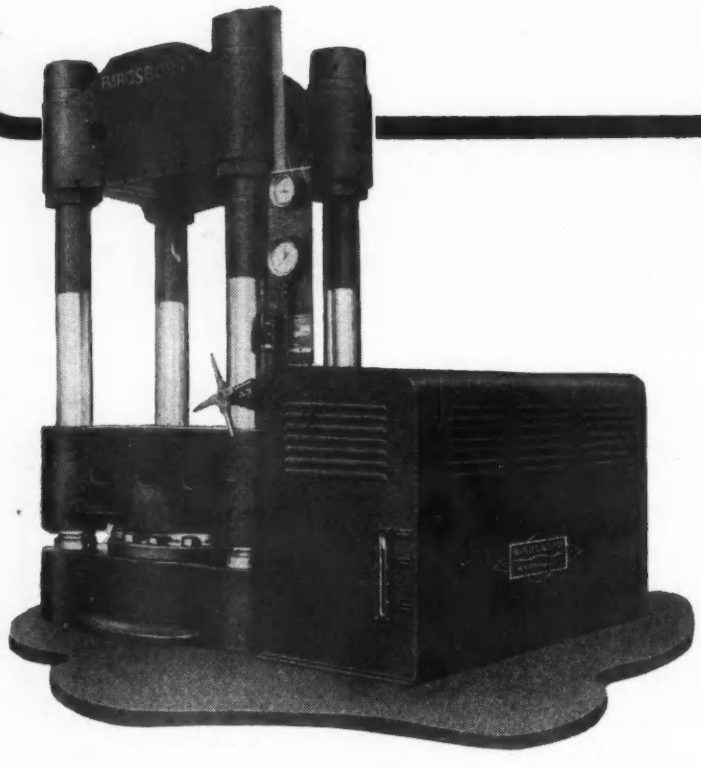
Name.....

Address.....

City..... *State*.....

IMMEDIATE PRODUCTION ... *with* SELF-POWERED PRESSES





These BIRDSBORO Self-Powered Plastic (Compression) Molding Presses are equipped with built-in Hydraulic systems complete with pumps and controls capable of producing required variable pressures and rates of speeds. This means that plants without existing accumulator facilities can rapidly get into production with these Birdsboro Plastic Compression Molding Presses.

Our specialty is designing and building hydraulic presses to meet the needs of the plastic industry. Take advantage of Birdsboro's long press-making experience to secure the presses you will need to meet competition.

BUY WAR BONDS

BIRDSBORO STEEL FOUNDRY & MACHINE COMPANY • BIRDSBORO, PENNSYLVANIA

BIRDSBORO

HYDRAULIC PLASTIC PRESSES

POST-WAR PLANS REALIZED!

SUCCESS IN ADVANCE . . . right now the future of many post-war products is being assured *well in advance* . . . For today more and more manufacturers are saying: "*Let's get in touch with Bridgeport Thermostat; let's incorporate Bridgeport bellows assemblies in our new designs.*"

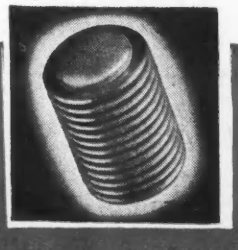
What is the result?

First, Bridgeport Thermostat engineers study Mr. Manufacturer's proposed product . . . specify the size and type of bellows and bellows assembly required, basing their recommendations on exact operating conditions.

Next, the manufacturer, acting on Bridgeport Thermostat's report, either buys bellows and completes his assemblies in his own shop or has Bridgeport do the entire job. If he does the latter he receives bellows assemblies on schedule, built to exact specification . . . ready to install . . . *usually at a cost much lower than would have been possible in his own plant.*

Yes, Bridgeport technique is the secret ingredient in countless devices which will amaze the post-war world with their ingenuity and efficiency.

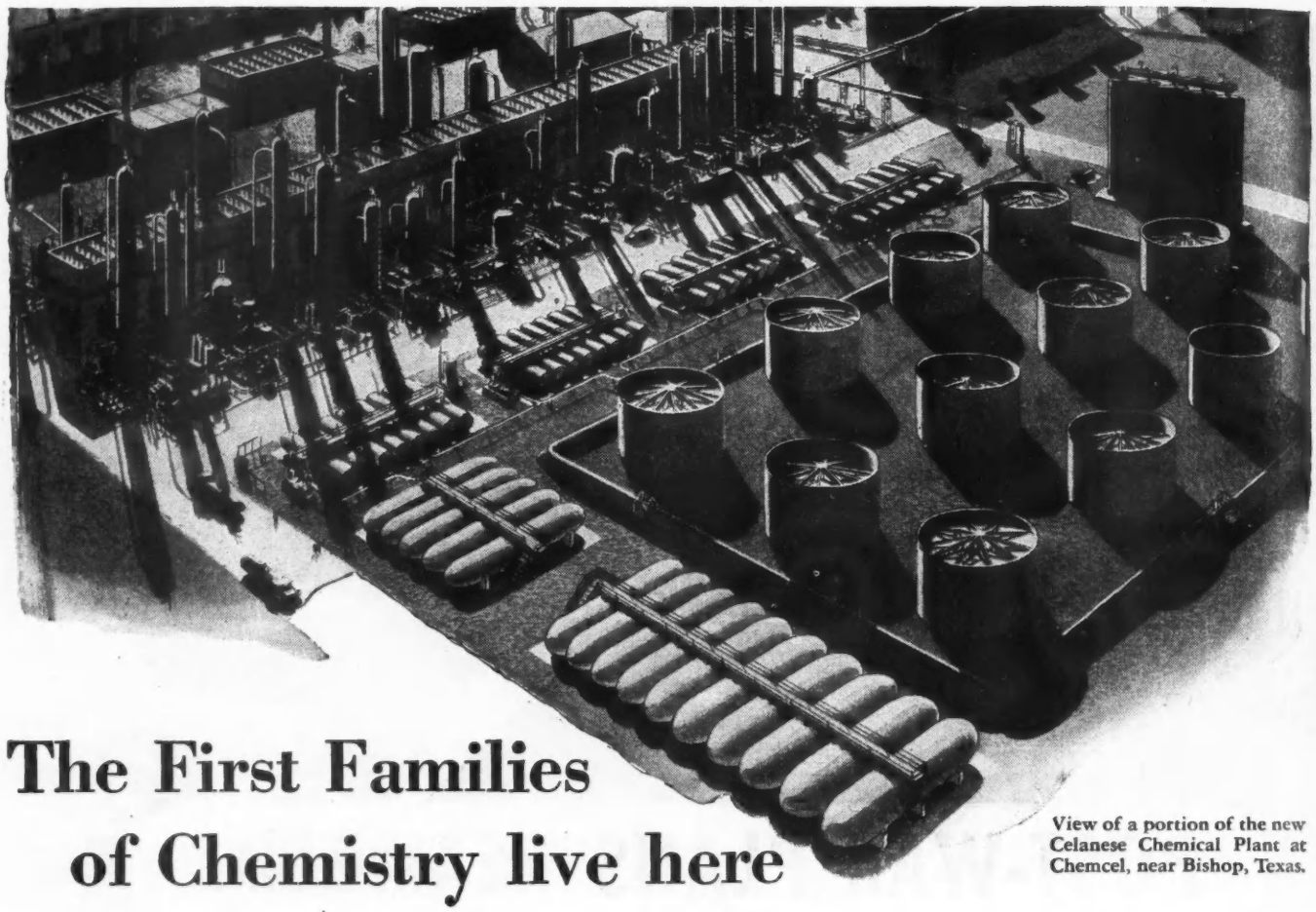
Write for Bulletin LB-100. It contains information of interest to everyone concerned with design and production of mechanical devices.



Bellows Assemblies . . . Bellows . . . Bellows Devices

BRIDGEPORT THERMOSTAT

COMPANY, INCORPORATED—BRIDGEPORT 1, CONN.



The First Families of Chemistry live here

View of a portion of the new Celanese Chemical Plant at Chemcel, near Bishop, Texas.

FROM this new Texas plant of Celanese Corporation of America will come an expanding range of Celanese Synthetic Chemicals. Especially engineered for efficient production of modern synthetics, some units are already starting operations.

The plant is close to plentiful sources of raw materials, petroleum and natural gas. From these basic materials a variety of highly useful chemicals can be made by synthesis, or rearrangement of the molecules. Many are completely new substances with properties and advantages not found in the chemical products of nature.

For example, one of the base chemicals produced by Celanese from petroleum is acetaldehyde. This tongue twister can be converted into the familiar acetic acid, an important chemical used in making Celanese Synthetic Yarns—or just as readily it can be converted into butadiene, a principal ingredient of synthetic rubber.

Other base chemicals can be produced from petroleum with equal ease, such as acetone, formaldehyde, methanol. In turn they can be converted into a host of valuable chemicals from which comes a large series of important chemical uses such as the production of synthetic plastics, lacquers, dyes, resins, adhesives, preservatives, essential oils, solvents, soaps, drugs, lubricants, antiseptics, anti-freezes.

Celanese Corporation of America is a business of chemistry which is founded upon practical research in synthetics. Its operations reach into all three related fields of synthetics—textiles, plastics and chemicals. Discoveries in one field logically supplement developments in the others.

Every Celanese Fabric is a synthetic—a man-created chemical which has been converted into a fibre and woven or spun into the finished textile; every Celanese Plastic is chemically produced.

Such is the marvelous versatility of synthetics, no lasting limitations are recognized by Celanese. Improvement is always the goal. It is a point of view that welcomes the challenge of creating materials with definite properties to meet definite needs rather than adjusting needs to an existing material.

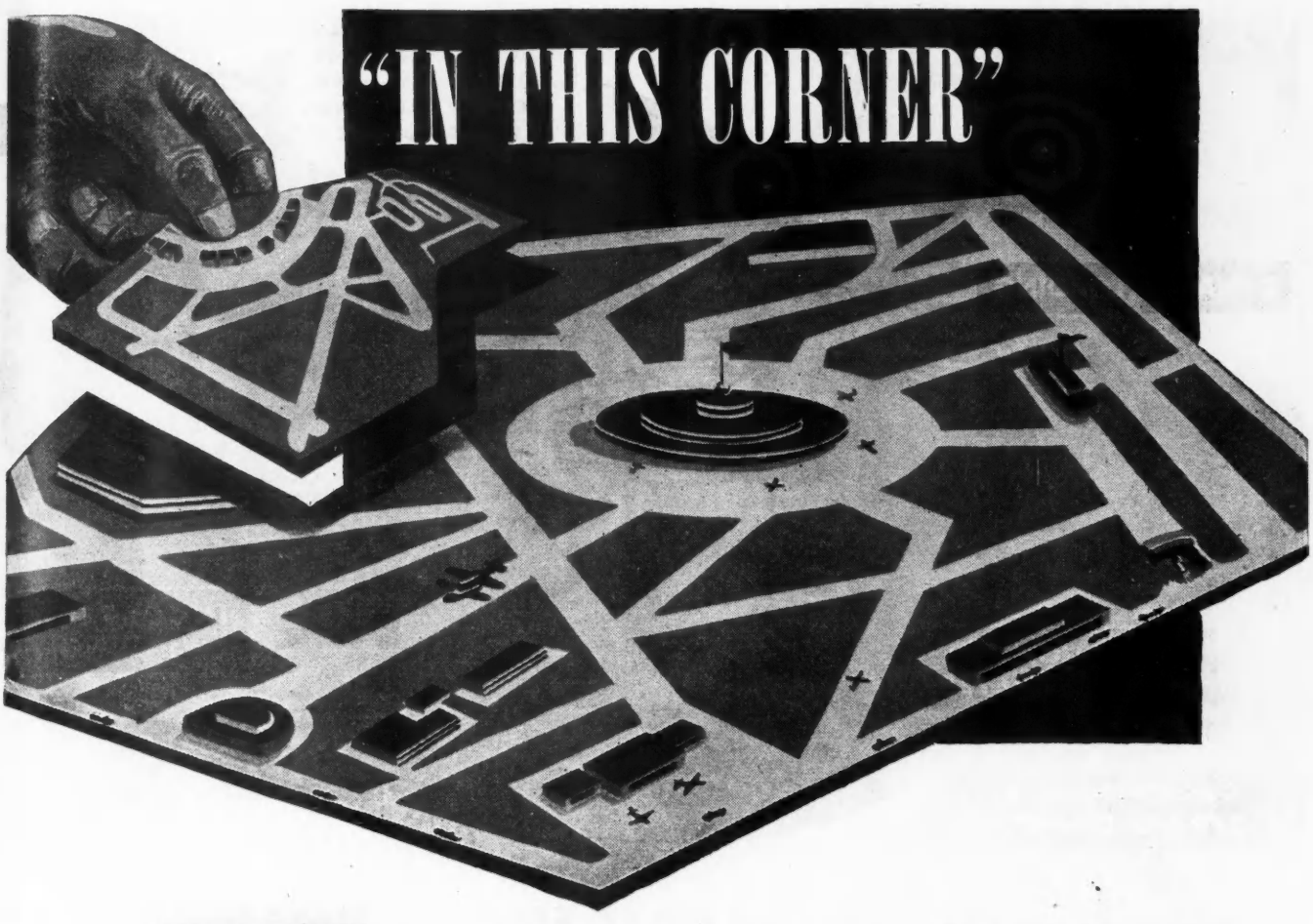
From this type of research approach came Celluloid*, the world's first plastic... Celanese*, the original truly synthetic yarn ...Lumarith*, the modern thermoplastic... Fortisan*, the strongest textile fibre... Lindol*, the pioneer synthetic plasticizer. From it will continue to come new and improved textiles, plastics and chemicals to contribute to the advancement of living. Celanese Corporation of America, 180 Madison Avenue, New York 16, N.Y.

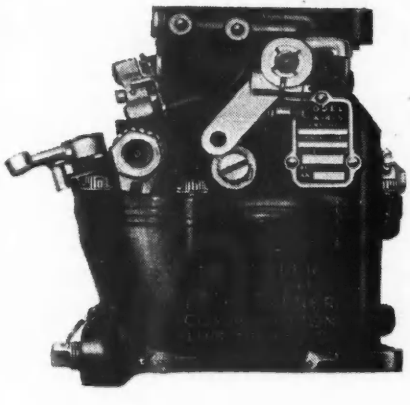
Celanese* { *TEXTILES* *PLASTICS* *CHEMICALS*

*Reg. U. S. Pat. Off.
Copyright 1945, Celanese Corporation of America

"GREAT MOMENTS IN MUSIC" PRESENTED BY CELANESE • EVERY WEDNESDAY EVENING COLUMBIA NETWORK COAST TO COAST*

"IN THIS CORNER"





Marvel-Schebler Carbureter
for Light Aircraft
Model MA 4-5

What's ahead for Aircraft? It seems to us the answer is in Fortune's April article on New York airfields, present and projected.

Idlewild, which is now in the earthfill stage, will be eight times larger than LaGuardia Field.

While granting that this new capacity is exclusively for the "big inch" air business, it follows that provision is being made for other fields that will accommodate a comparable increase in light plane traffic. Here is a potent source of profitable post-war business, likewise a means of taking up the slack in war industries employment without jarring.

MARVEL-SCHEBLER CARBURETER DIV.,
BORG-WARNER CORP.
FLINT 2, MICHIGAN

ONE FOR PRESENT NATIONAL SAFETY
U.S. WAR BONDS
BUY TWO
ONE FOR FUTURE PERSONAL SECURITY

MARVEL-SCHEBLER
Carbureter

FOR LIGHT AIRCRAFT

AVOIDING *the* UNAVOIDABLE

In spring as in wire, there are small but unavoidable variations in diameter which may greatly affect spring performance; stresses due to dynamic and eccentric loading; vibration transmitted from outside sources; rubbing contact; buckling; and other factors which defy theoretical calculations.

It is the business of Cleveland spring experts to design springs so as to avoid failures due to both avoidable and unavoidable causes, yet producing the simplest, most inexpensive springs which will do the work.

The Design Service of this organization, backed by seventy years of experience, is yours for the asking, without cost or obligation. More and more, large spring users and their product engineers, by availing themselves of this service, find they can avoid spring failures which in the past have often been thought unavoidable.

The best time to consult Cleveland spring engineers, is while plans are yet in their preliminary stages, when changes, if needed, can be made with the least trouble and expense.

Cleveland SPRINGS

CLEVELAND WIRE SPRING CO.

1281 East 38th Street, Cleveland 14, Ohio

Apparently OK, but . . .
Magnesium casting as seen under ordinary white light
SEEN IN A NEW LIGHT
Indications in same casting as revealed by fluorescent penetrant inspection using ZYGLO equipment and materials. Each glowing line marks a point of possible failure.
Defective!

ZYGLO*

FLUORESCENT PENETRANT INSPECTION

Reveals Surface Flaws Non-Destructively

With ZYGLO, you can quickly inspect every casting for flaws before costly time and labor are added to the defective part. ZYGLO assures fast thorough inspection—applicable to all cast metals but particularly useful with aluminum, magnesium and other non-magnetic types.

ZYGLO's brilliant fluorescent indications reveal shrinkage cracks, cold shuts, porosity, blow holes and surface cracks clearly and unmistakably. The photograph above gives only a faint suggestion of how bright such discontinuities appear to the inspector's eye.

It's only sound business practice to check all your castings with ZYGLO—non-destructive, fast in operation . . . and reject in advance those units which are defective.

Write for illustrated bulletin and full facts about ZYGLO equipment and materials.

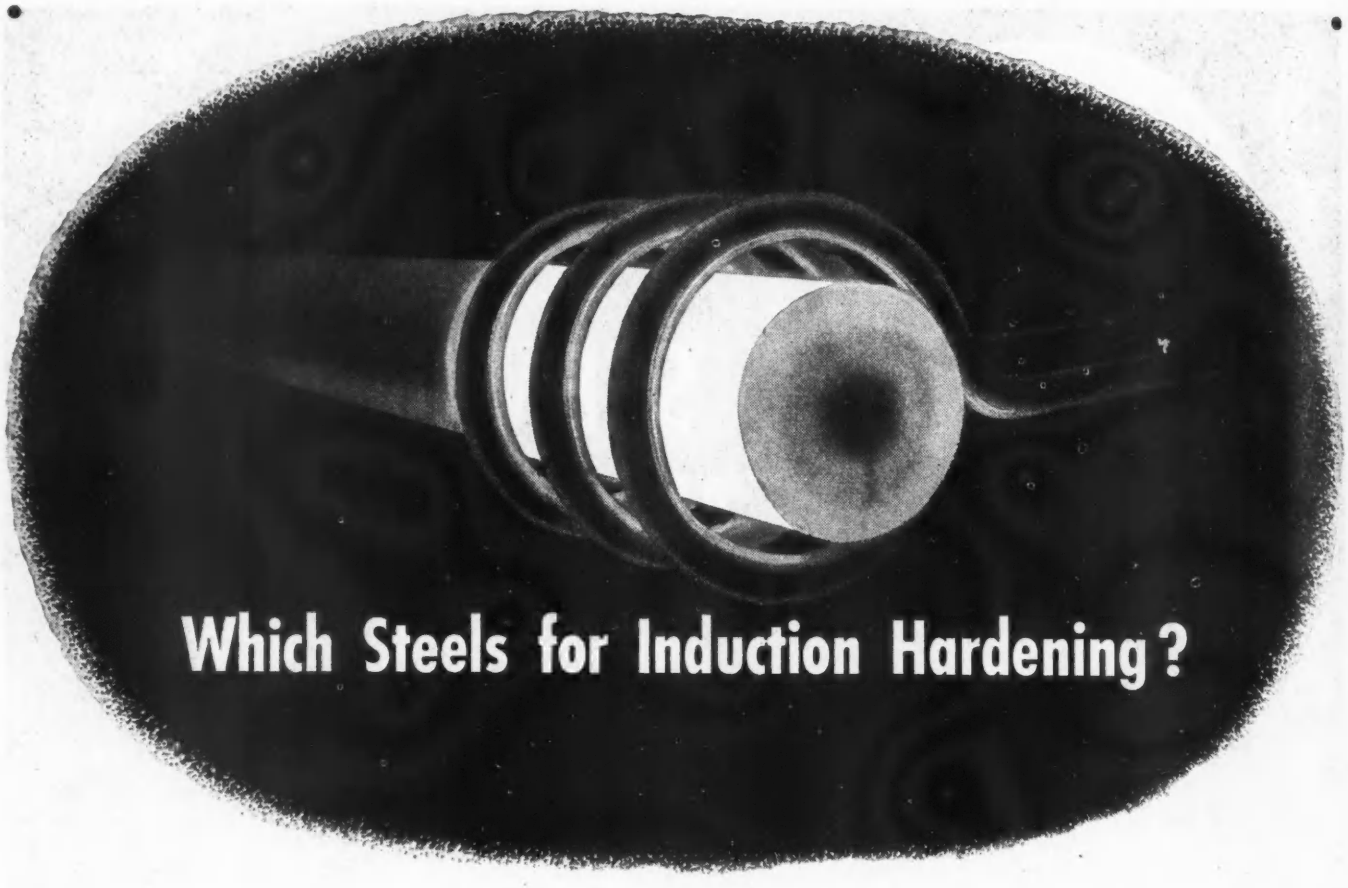
*ZYGLO, registered U. S. Patent Office, a trade mark of Magnaflux Corporation applied to its equipment and materials for fluorescent penetrant inspection.

The fluorescent penetrant inspection methods are covered by U.S. Letter Patent No. 2259400.

MAGNAFLUX CORPORATION

MAGNAFLUX CORPORATION • 5904 NORTHWEST HIGHWAY, CHICAGO 10, ILLINOIS

New York • Detroit • Dallas • Los Angeles • Cleveland • Birmingham



Which Steels for Induction Hardening?

We are frequently asked to recommend steels suitable for treating by the induction-hardening process. In considering this question, it is necessary to bear in mind the following:

Conventional steels hardened by the induction method may, under certain circumstances, exhibit greater surface-hardness values than would be anticipated with the usual types of heat-treating. As a result, adjustments in composition may be indicated to meet designated end physicals.

Moreover, shallow- and deep-hardening characteristics, metallographic structure, and machineability frequently enter the picture. It can be seen, therefore, that recommendations of specific analyses can be made only after a thorough study of the proposed application.

If you are using or are considering the use of induction-hardening equipment, it is important to choose the types of steels most adaptable to this process. The experience of Bethlehem metallurgists is at your disposal, and they will be glad to help in the selection of steels that will do the best job.

BETHLEHEM STEEL COMPANY, Bethlehem, Pa.
Bethlehem Steel Export Corporation, New York City

★ ★ BETHLEHEM STEEL ★ ★

Its excellent optical qualities insure clear vision . . . its ease of forming means fewer "blind spots"

Crystal-clear transparency without distortion and excellent optical qualities are priceless fighting assets that "Lucite" provides for our airmen on these and many others of America's fighting planes. In turrets, nosepieces, cockpit enclosures, and windows, "Lucite" is helping our pilots and gunners to see straight, fly straight, shoot straight.

There are other advantages, too, in this widely used material. For example, consider the advantages of high tensile and flexural strength, light weight, resistance to many chemicals and excellent weathering qualities of "Lucite" methyl methacrylate resin.

In addition, the ease of machining "Lucite" and its ability to be heated and formed into large single-piece enclosures helps in other important ways: fewer structural supports and larger panels result in less overall weight and fewer blind spots. Faster production too. The one-piece canopy on the Mustang P-51, for instance, was manufactured at a saving of 45% in man-hours as compared with earlier methods of construction.

Yes, you'll see more and more "Lucite" on the battle planes of today, and on the peacetime planes to come.

"Lucite" is obtainable for war orders and in experimental quantities for test purposes. Write E. I. du Pont de Nemours & Co. (Inc.), Plastics Department, Arlington, N. J., or 5801 South Broadway, Los Angeles, California. In Canada: Canadian Industries, Ltd., Box 10, Montreal.

Buy and Hold WAR BONDS

DU PONT — BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY

FOR PLASTICS . . CONSULT DU PONT

THE EASIEST-TO-USE DIE HEAD ... and the Fastest

Here is an improved NAMCO non-rotating DIE HEAD that "streamlines" the whole thread-cutting operation —brings new ease of operation and convenience— shortens idle time—gets more work done.

Open or Close from any position

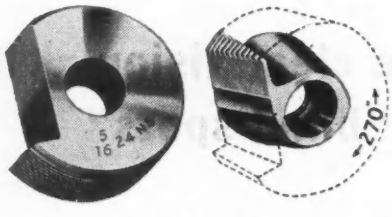
Close die by a quarter-turn from open position, in *either* direction. Handle is always in easy reach no matter where die head is positioned on machine.

Replace Chasers in *Seconds*

Merely lift the handle and chasers, mounted on blocks, slide out of grooves. From dull to sharp chasers is a matter of a few seconds—no screws to loosen or tighten—no change of precision.

The Circular Chaser Principle

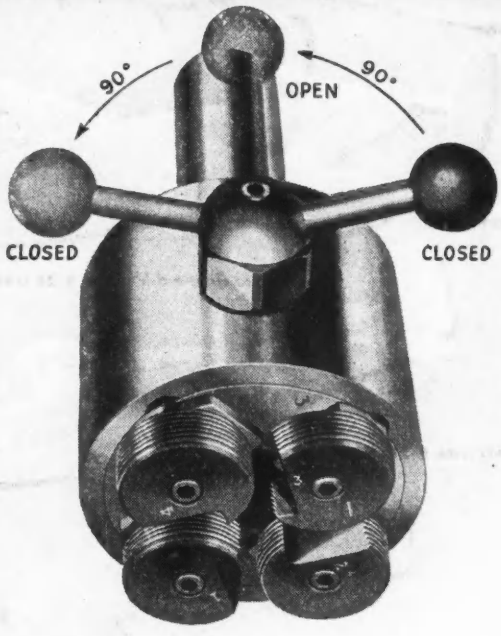
Namco Circular Chasers have proved their ability to produce more precision work. They eliminate trial cuts—the first piece is *production*—uniform precision insured throughout long runs.



Circular chasers may be ground through 270° circumference, increasing chaser life 10 to 50 times longer than other types.

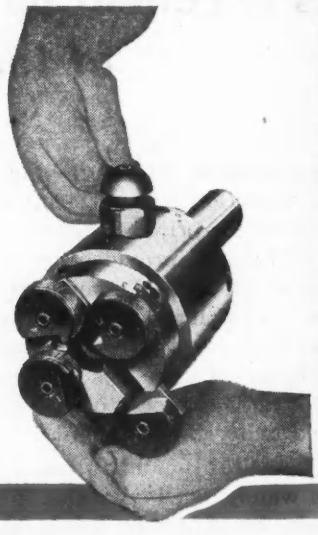
Here is your complete data

The new Namco Die and Tap Catalog, D-42-B, gives you all details of Namco tools for high-speed precision work. Send for your copy.



Open and close with 90° turn of handle, in *either* direction.

Lift handle to remove chasers . . . no screws to turn, no adjustment to make.



The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley 4-6 and 8 Spindle Bar and Chucking Automatics • Single Spindle Automatics • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

BOILED DOWN

TO SIMPLIFY MOTOR SELECTION

● **This new booklet gives ratings, sizes, characteristics, dimensions, where-to-use data, *and prices* of General Electric a-c and d-c motors, 1/16 to 75 hp. Everything you need to know to select these sizes—all in 16 pages!**

Builders of TRI-CLAD Motors

Buy all the BONDS you can—*and keep all you buy*

To Save Your Time Later Mail This Coupon Today—

General Electric Company, Schenectady 5, N. Y.

Please send me a copy of your Condensed Motor Catalog (No. GEA-4281).

Name.....

Company.....

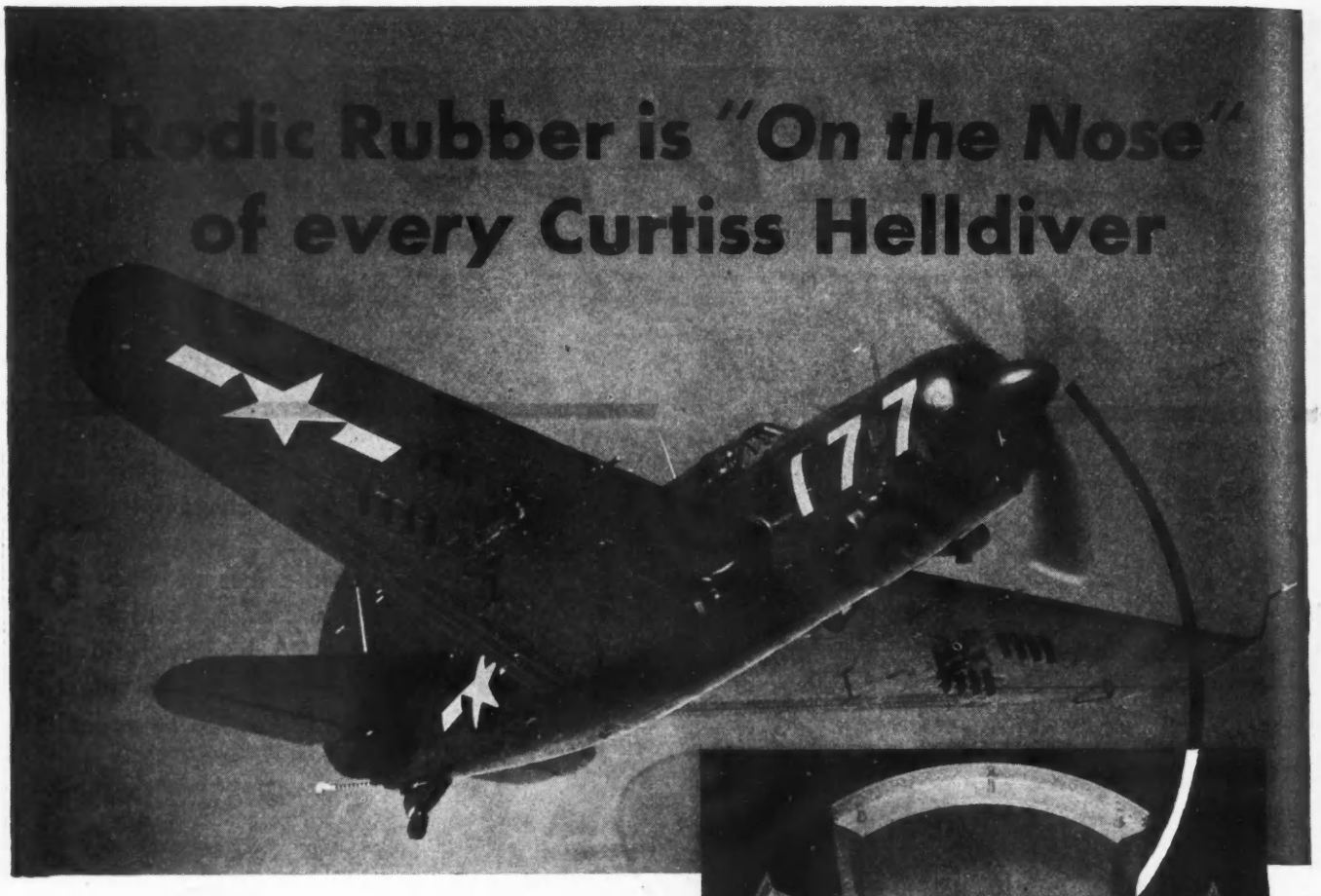
Address.....

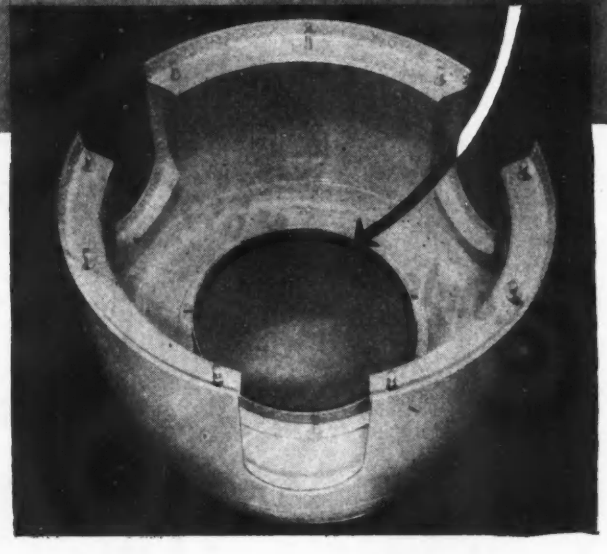
City.....**State**.....

750-258-488

GENERAL ELECTRIC

Rodic Rubber is "On the Nose" of every Curtiss Helldiver





MOUNTED inside the cone-shaped 'spinner' which covers the propeller hub of every Curtiss Helldiver is an aluminum and rubber ring. Another of those "tremendous trifles" for which Rodic is famous, it acts as a vibration damper between the propeller and its supporting frame on the nose of the plane.

Pictured above is the Curtiss SB2C-4, newest version of the Navy's Helldiver, looking deadlier than ever in its new midnight blue camouflage. In the inset is an interior view of the 'spinner', showing the bonded ring. Manufactured only by Rodic, this ring, with its sturdy bond between metal and rubber, is one more of the many outstanding developments that have come out of Rodic's research laboratories.

The distinguished skill and untiring effort of the engineers and technicians working day and night in Rodic laboratories have made, and still are making, vital contributions to the war effort. Those same splendid facilities and keen brains will be available to you as soon as the needs of our armed forces have been met.

Why not bring your postwar rubber problems to us now for preliminary consideration? We have important help to give you.

For *Sealing Unlimited*

...SEALING *In* GASOLINE, OIL OR HYDRAULIC FLUID
...SEALING *Out* DIRT, MOISTURE OR AIR
...SEALING *Against* VIBRATION OR SHOCK

RODIC RUBBER CORPORATION
GARWOOD, N. J.

ESTABLISHED 1925... 20 YEARS OF EXPERIENCE IN THE CHEMISTRY AND TECHNOLOGY OF RUBBER

GETTING DOWN TO CASES

...On Case-Hardened Steel

AVIATION ENGINE PARTS
BEARINGS
BUSHINGS
CAMS
CHUCK PARTS
CRANK SHAFTS
CYLINDERS
FAN BLADES
GAGES
GEARS
KING PINS
NOZZLES
PINIONS
PISTON PARTS
PLUNGERS
PUMP PARTS
RATCHETS
RETAINING RINGS
ROCKERS
SHACKLE BOLTS
SHAFTS
SOCKETS
SPINDLES
STEERING WORMS
STUDS
TEXTILE GUIDES
TYPEWRITER PARTS
VALVES AND SEATS
WIRE DRAW PLATES
WRIST PINS
YOKE NUTS
DIESEL ENGINE FUEL INJECTOR PUMP PARTS

HERE ARE a few of the successful applications of Nitralloy from our constantly growing Case-History files.

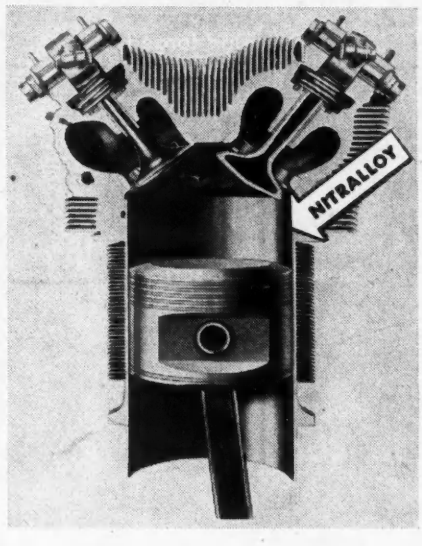
Wherever sapphire-hardness and high fatigue resistance are required ... wherever steel moves against steel under conditions inviting lubrication failure – wherever parts must retain their hardness at 750°F. –that's where Nitralloy is indicated.

If all or any of these Nitralloy properties will improve your product, it will pay you to specify and use Nitrided Nitralloy – the hardest steel surface known.

Nitriding is the process of case hardening certain alloy steels by means of a nitrogenous medium such as ammonia gas. The alloy steels that are most suitable for Nitriding are known as Nitralloy.

Write on your business letterhead for the 40-page booklet "Nitralloy."

Find out what NITRIDED NITRALLOY *can do to extend the life and dependability of your peacetime machinery. Send us your specifications. Our applications engineers will study them and submit recommendations—for your use in planning Victory products. Or just ask for booklet—no obligation to you either way.*



Where surfaces must have extreme hardness to resist wear, Nitrided Nitralloy is the logical choice. Here Nitralloy protects engine cylinder barrels.

7879

THE NITRALLOY CORPORATION
230 PARK AVENUE
NEW YORK 17, N. Y.

Companies Licensed by The Nitralloy Corporation

Allegheny Ludlum Steel Corp.....Watervliet, N. Y.
The Babcock & Wilcox Tube Co.....Beaver Falls, Pa.
Bethlehem Steel Co.....Bethlehem, Pa.
Carnegie-Illinois Steel Corp.....Chicago, Ill.
Copperweld Steel Co.....Warren, O.
Crucible Steel Co. of America.....New York, N. Y.
Firth-Sterling Steel Co.....McKeesport, Pa.
Republic Steel Corporation.....Cleveland, O.
The Timken Roller Bearing Co.....Canton, O.
Rotary Electric Steel Co.....Detroit, Mich.
Vanadium-Alloys Steel Co.....Pittsburgh, Pa.
Atlas Steel Limited.....Welland, Ontario

Operating & Accredited Nitriding Agents

Commercial Steel Treating Corp.....Detroit, Mich.
Englehard & Kenny.....North Arlington, N. J.
The Lakeside Steel Improvement Co.....Cleveland, O.
Lindberg Steel Treating Co.....Chicago, Ill.
Link-Belt Co.....Philadelphia, Pa.
Met-Lab, Inc.....Philadelphia, Pa.
New England Metallurgical Corp.....Boston, Mass.
Pittsburgh Commercial Heat Treating Co.
Pittsburgh, Pa.
Queen City Steel Treating Co.....Cincinnati, O.
Rex & Erb.....Lansdale, Pa.
The Salkover Metal Processing Co., Inc.
Long Island City, N. Y.
Wesley Steel Treating Co.....Milwaukee, Wis.
N. A. Woodworth Co.....Ferndale, Mich.
Ontario Research Foundation..Toronto, Ontario, Can.

Manufacturers of Nitralloy Steel Castings

Milwaukee Steel Foundry Div.,
Grede Foundries, Inc.....Milwaukee, Wis.

Warehouse & Stock

A. Milne & Co.....New York, N. Y.

P & N DIRECT LINE
Swaged Hooks
OFFER NEW SAFETY FEATURES!

Sizes for 3/16" to 1" cable
Tightly swaged— Give foul-free surface
Straight shank
Precision forged of alloy steel
Smooth inside surface
Ample radius
Finished point
Load is carried on direct line from cable, prevents slipping

Now for the first time Poulsen & Nardon offer a complete line of hooks that can be swaged to cables from 3/16" to 1" in diameter. This permits faster, safer fastening. No more costly splicing with jagged, dangerous ends. P & N Direct Line Swaged Hooks are smooth, streamlined and foul-free!

For complete information, call your P & N Distributor listed below or write for new folder.

P&N

ESTABLISHED 1922

POULSEN & NARDON, INC.

Terminal Box 2398 • Los Angeles 54, California

Lee Bridges Industries, Ltd.
Aircraft Section, Priory Works
Arterial Road, Southend-on-Sea, England

Electrical Distributors, Ltd.
Honolulu 10, Hawaii

Hawthorne Aero Supply
Orangeburg, South Carolina

Palmer Aircraft Products Co.
1411 4th Avenue
Seattle, Washington

LINCOLN

Single Line

CENTRO-MATIC LUBRICATING SYSTEMS

Save BEARINGS...MACHINE HOURS...MANHOURS...POWER... and PREVENT ACCIDENTS

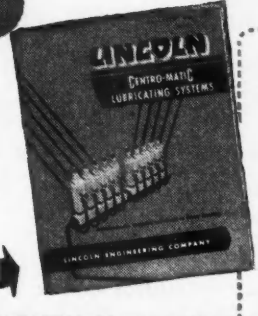
Lincoln Centro-Matic, Single-Line Lubricating Systems are simple in design and are easy to install on all types of industrial machinery and equipment —all that is required is a Centro-Matic Injector for each bearing, arranged singly or in manifold, and connected by only a *single line* to a Centro-Matic Lubricant Pump. The pump can be either manually-operated or power-operated. Power-operated systems can have time clock or push-button control.

In addition to providing positive lubrication, these systems save time and minimize accidents. Machines can be lubricated while in operation, and since lubricant is delivered direct to every bearing from a centrally located pump, it is not necessary to work between gears, belts and conveyors as is the case when individual grease cups or fittings must be contacted.

The Terkelsen gear driven plastic press illustrated includes a Lincoln Centro-Matic Lubricating System as standard equipment.

ENGINEERING SERVICE...

Lincoln Engineering Company maintains a staff of experienced lubrication engineers prepared to assist you in all lubrication problems. Write us, enclosing a blueprint or specifications of the machine you wish to lubricate, and we will make a recommendation as to the type of Centro-Matic System best suited to do the job. This service is cost free. The coupon below will bring you complete bulletins.



SEND FOR THIS BULLETIN

I WOULD LIKE TO HAVE FREE BULLETIN
On Lincoln Single Line Centro-Matic Lubricating Systems

*Name*_____

*Title*_____

*Company*_____

*Address*_____

*City*_____ *State*_____

AAI B2511-A

ARMY E NAVY

LINCOLN ENGINEERING COMPANY

Pioneer Builders of Engineered Lubricating Equipment

5701 NATURAL BRIDGE AVE., ST. LOUIS 20, MO., U. S. A.

LINCOLN

FOR UNIFORMS THAT BUILD CONFIDENCE—*DEMAND*

REEVES ARMY TWILL

"FROM COTTON TO CUTTER"

Leading milk and food delivery systems specify *invasion-tested* Reeves Army Twill for durable, smart-looking uniforms. This top-quality fabric helps build consumer confidence and employee morale. Over 90 million yards have already been sold to the Government to equip America's fighting men, where it is proving itself under the toughest climatic and combat conditions of global war. Sanforized Shrunk* and color-fast to sun, water and perspiration, it will meet *your* post-war uniform needs.

**Residual shrinkage less than 1%*

THE REEVES FABRIC GROUP INCLUDES: *Reeves Army Twill • Glengarrie Poplin • Reeveking Gabardine • Byrd Cloth • Marine Herringbone • Mountain Cloth • Warrior Twill*

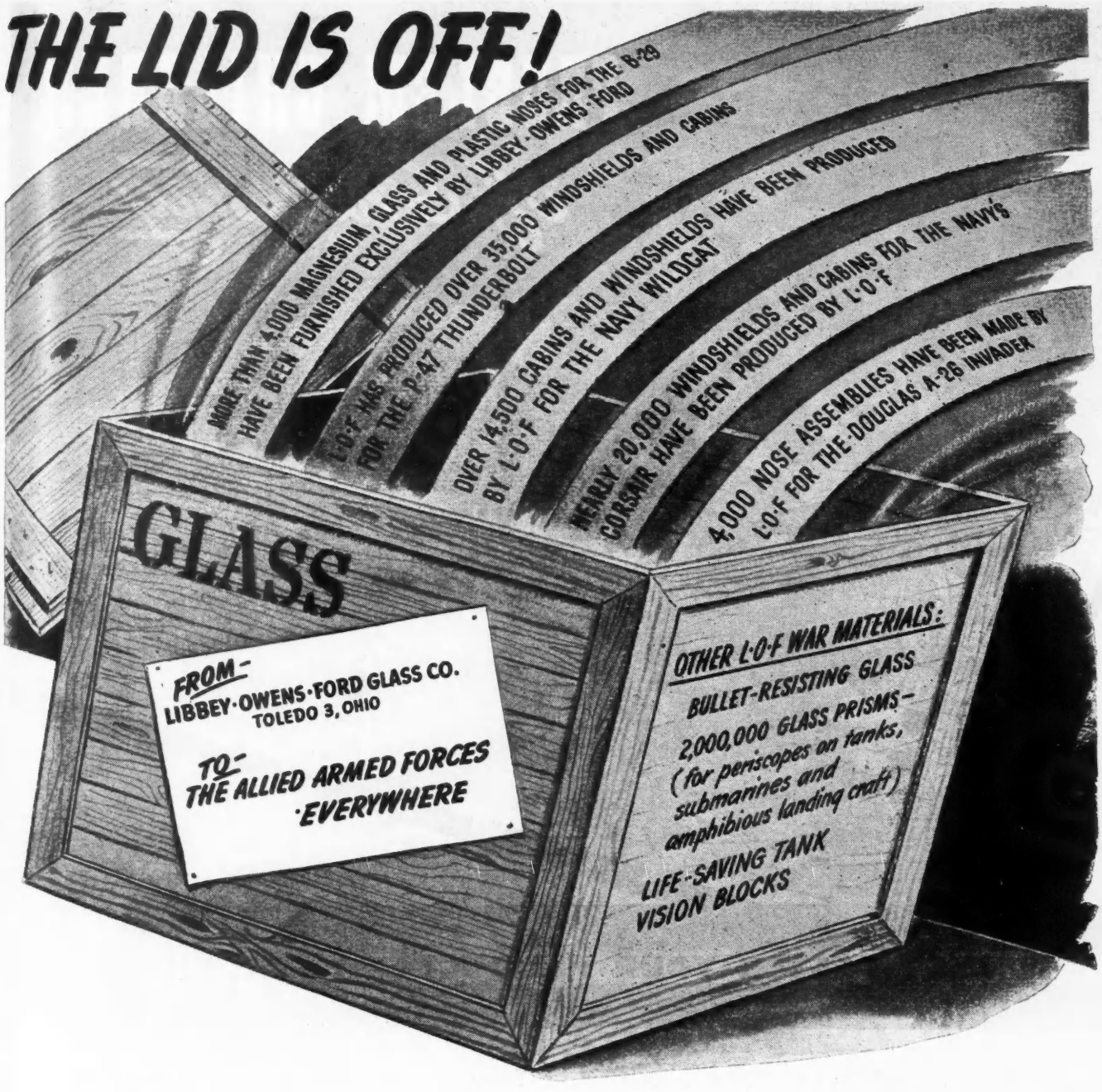
SPINNING WEAVING DYEING FINISHING Reeves FABRICS

REEVES BROTHERS, INC.

54 WORTH STREET • NEW YORK 13, N. Y.

Mills Mill, Greenville, S. C. and Woodruff, S. C.
Fairforest Finishing Co., Spartanburg, S. C.

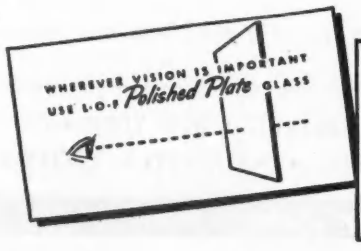
Representatives in Atlanta • Boston • Chicago • Dallas • Los Angeles • Philadelphia • St. Louis • Montreal • Toronto


THE LID IS OFF!
MORE THAN 4,000 MAGNESIUM, GLASS AND PLASTIC NOSES FOR THE B-29 HAVE BEEN FURNISHED EXCLUSIVELY BY LIBBEY-OWENS-FORD
L·O·F HAS PRODUCED OVER 35,000 WINDSHIELDS AND CABINS FOR THE P-47 THUNDERBOLT
OVER 14,500 CABINS AND WINDSHIELDS HAVE BEEN PRODUCED BY L·O·F FOR THE NAVY WILDCAT
NEARLY 20,000 WINDSHIELDS AND CABINS FOR THE NAVY'S CORSAIR HAVE BEEN PRODUCED BY L·O·F
4,000 NOSE ASSEMBLIES HAVE BEEN MADE BY L·O·F FOR THE DOUGLAS A-26 INVADER
GLASS
FROM— LIBBEY·OWENS·FORD GLASS CO. TOLEDO 3, OHIO
TO— THE ALLIED ARMED FORCES ·EVERYWHERE
OTHER L·O·F WAR MATERIALS:
BULLET-RESISTING GLASS
2,000,000 GLASS PRISMS— (for periscopes on tanks, submarines and amphibious landing craft)
LIFE-SAVING TANK VISION BLOCKS

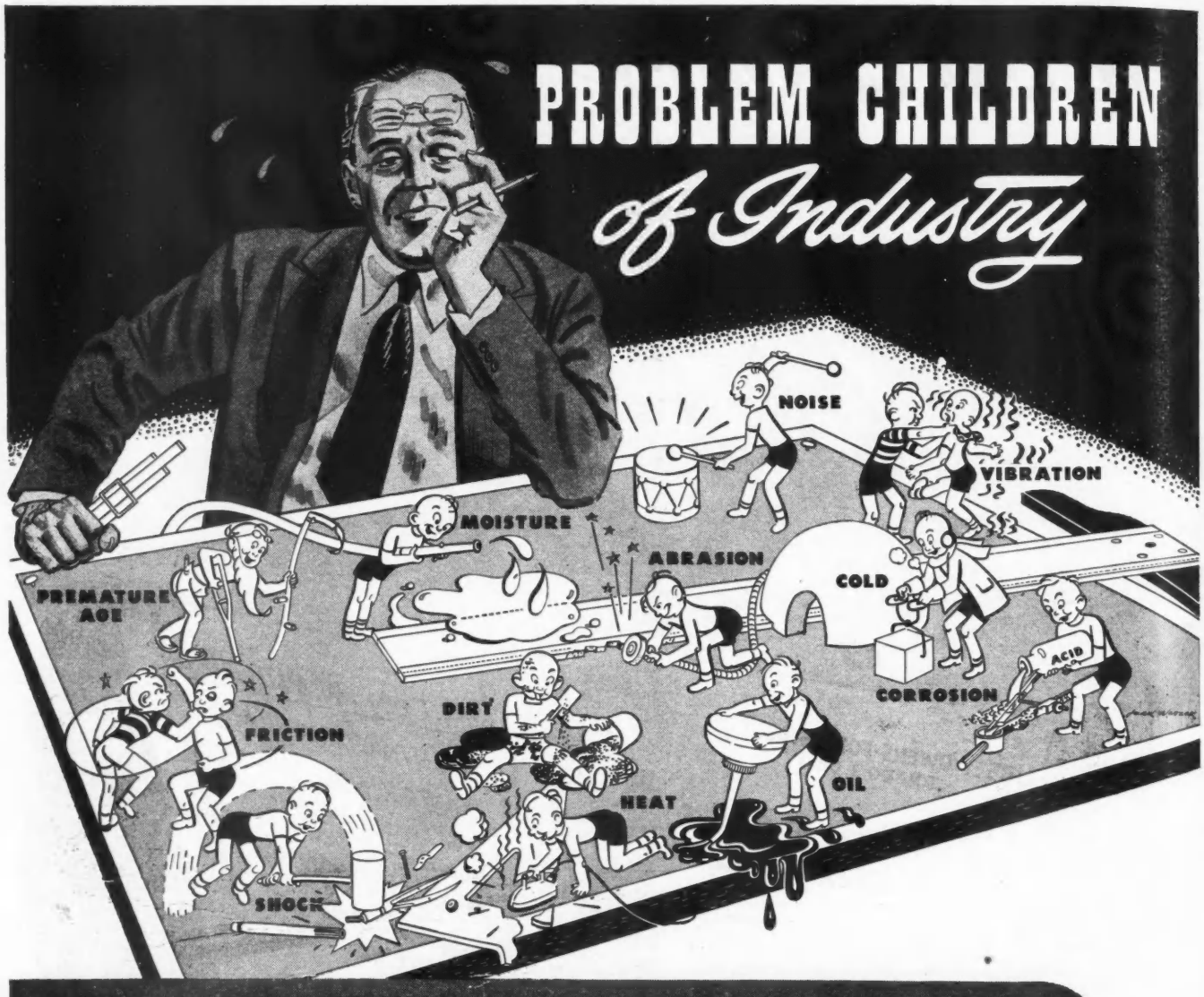
Yes, the lid is off! The B-29, the A-26, the P-47 and other winged demons from American assembly lines are tops. That is why Libbey·Owens·Ford is mighty proud that it has been working since 1941 with aircraft manufacturers and the Armed Service technicians in the production of equipment such as this.

Libbey·Owens·Ford's achievements have not been in quantity alone. Our manufacturing and research staffs have made contributions in improved production methods and in scientific developments of the weapons themselves which have won the commendation of all of the armed services.

As a result of L·O·F's increased knowledge in the manufacture of quality safety glass, postwar automobiles, trucks, buses and other transportation units will be glazed with the finest safety glass ever produced by Libbey·Owens·Ford Glass Company. The identifying L·O·F shield will continue to be an assurance of the best quality in safety glass.



L O F **LIBBEY·OWENS·FORD**
a Great Name in **GLASS**



IF THEY PESTER YOUR PRODUCT → CALL ORCO

VIBRATION . . . SHOCK . . . FRICTION . . . . CORROSION . . . these and many other destructive "imps" are the *"problem children of Industry."* Uncontrolled, they wreak havoc with good products . . . impair product efficiency . . . shorten product life.

Not in all cases, but in an immense number of cases, these *"problem children of Industry"* can be . . . *and are* . . . brought under control by correct applications of rubber and synthetic rubber.

A whole new world of "rubber controls" was cracked wide open by the impact of war. Pre-war limitations in the applications of rubber and synthetic rubber were swept aside in the drive for new materials and improved methods of compounding, molding, extruding, calendering, coating and bonding.

Today, and in the tomorrow to come, Industry can . . . *and will* . . . look to rubber and synthetic rubber to a greater degree than ever for solutions to the countless problems of product development in a highly competitive world.

ORCO (The Ohio Rubber Company) is not resting on its wartime achievements. ORCO research facilities are under constant expansion. ORCO production methods and equipment are under progressive development.

The ORCO goal is still greater control of the "problem children of Industry."

YOUR inquiries on specific problems are invited.

"ORCO-OPERATION"

BRANCHES: DETROIT • NEW YORK • CHICAGO
INDIANAPOLIS • WASHINGTON • CLEVELAND

THE OHIO RUBBER COMPANY · WILLOUGHBY, OHIO

TIME-SAVER ON ALL TYPES OF SLOTTING

The 36" stroke Hy-Draulic Slotter speeds up production of big heavy slotting jobs. Powerful and rugged, it is fast, easy to operate, efficient. The early installation shown at upper right saved some 40% on machining crown brass fits. Later machines make similar savings on a wide variety of work.

Some of the Hy-Draulic Slotter features that provide these operating advantages are: power rapid traverse in all directions; start, stop and jog buttons on handy pendant; centralized controls, built-in dividing head, tilting ram. These, and the basic advantages of hydraulic feeds, are described in a bulletin that will be sent to interested executives on request. Please ask for Bulletin 2606.

ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS

Snyder Special for BORING, FACING *and* TAPPING
Heavy-Duty Valves for Oil Fields

Machining valves to handle the oil that keeps our war machine running was slow and costly by conventional methods and called for skilled help which was hard to get. For one particular manufacturer of these heavy-duty valves, this Snyder special-purpose boring, facing and tapping machine solved these problems effectively.

Boring and facing is done with a four speed, single spindle head which is driven and advanced into the work by a Snyder self-contained hydraulic guide bar unit.

To the left of the operator and in front of one of the two boring units is installed a lead screw tapping device which has also a variable tool spindle speed. The entire tapping unit is mounted on a guide bar slide for hydraulic rapid advance.

Spindles are equipped with a breech lock and special tapered holes to make the exchange of tools quick and easy.

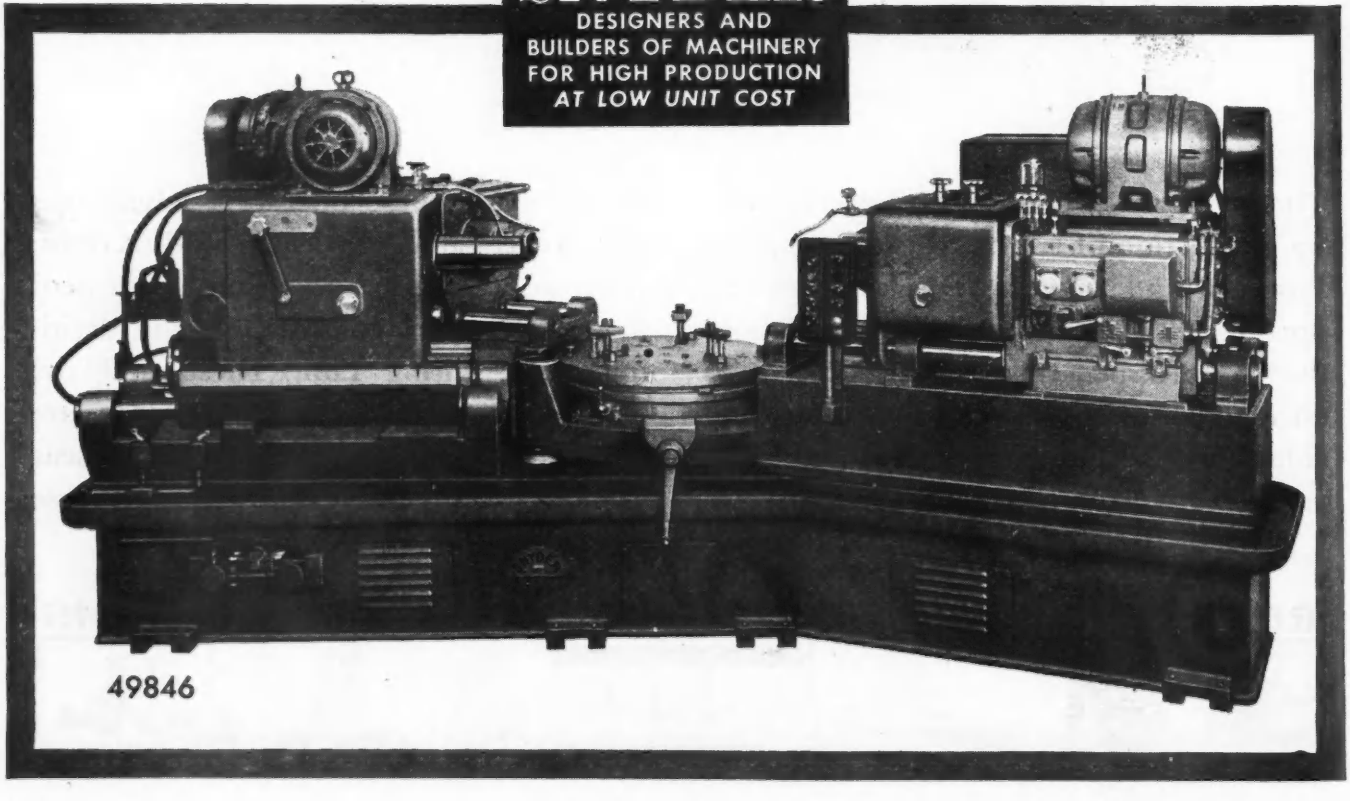
The index table is mounted on a manually operated elevating mechanism which compensates for the various sizes of work and also brings the tools concentric with the boss on the work-piece. This table is indexed for 180° with an intermediate index for the tapping operation.

Although production in terms of units is relatively low, the savings accomplished by such machines are substantial. These savings affect time, handling, operator fatigue, operating skill, quality and uniformity of finish. Similar savings can be accomplished in the machining of other types of large, heavy parts.

If you are looking for ways to reduce the cost of any metal cutting operation it is likely that our experience as specialists in that field can be of considerable value to you. We invite your inquiries. *Snyder Tool & Engineering Company, 3400 E. Lafayette Avenue, Detroit 7, Michigan.*

20 Years of Successful Co-operation with Leading American Industries

SNYDER
DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST



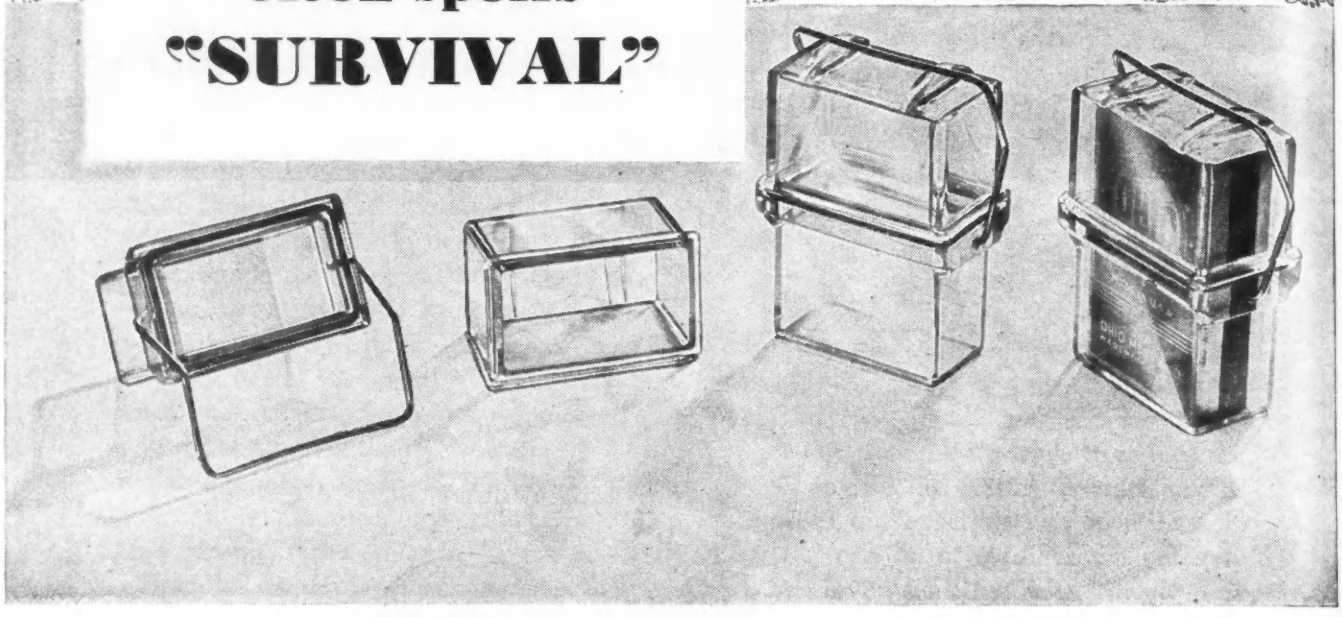
49846

A balanced chemical composition preserves the high strength of Otiscoloy throughout fabricating and welding operations. May be hot or cold formed. Excellent weldability. Resists corrosion and abrasion. A steel that lends itself to many new applications.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH 30, PENNSYLVANIA

WATERPROOF PACKAGING often spells "SURVIVAL"



STANDARD offers engineering help on your product or its service requirements

Your life may never depend on dry matches, as the lives of our service men sometimes do. But there may be times when waterproof packaging or other achievements of injection-molded plastics can be an important factor in your product's survival over stiff competition.

Notice the functional design of the plastic matchbox container engineered by *Standard Molding* of Dayton to meet service conditions. The gasketed seal is held by the *Standard*-designed metal bale tension unit. This is but a single example of *Standard's* designing and engineering service which is available to you.

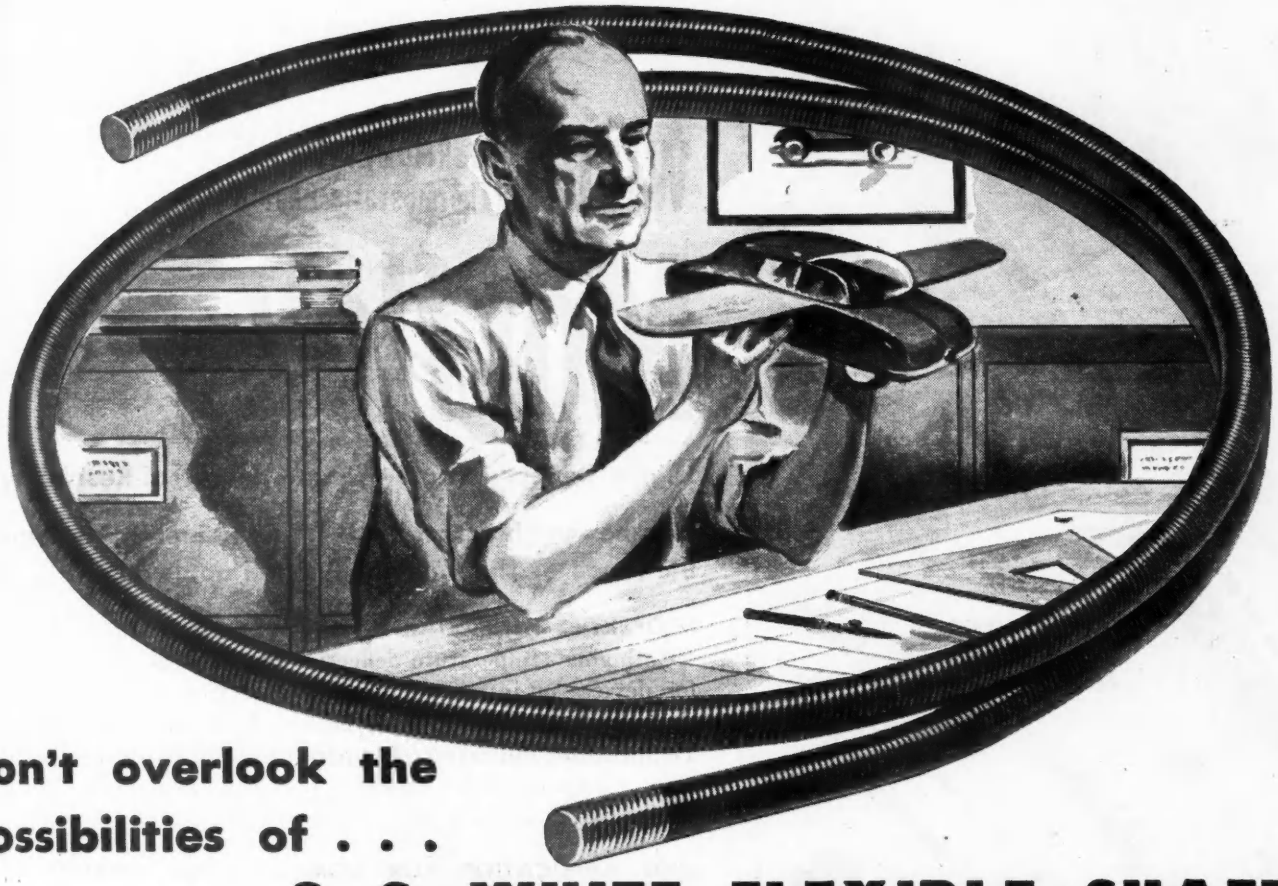
Why not get the complete story as applied to your own product or its services? Let *Standard* engineers analyze your blueprints and submit ideas for production economies, product improvement or service requirements through use of custom-molded plastics packages similar to these. Write or phone Dayton or branch nearest you.

Branches: NEW YORK—R. S. Christie Co., 175 Fifth Ave., Tel. Gramercy 7-8929.
CHATTANOOGA—Standard Molding Corp., P. O. Box 350, Tel. 62101.

STANDARD SMC MOLDING *Corporation*

460 Bacon Street, Dayton 1, Ohio HEmlock 8307

TO DESIGNERS OF TOMORROW'S AUTOMOBILES



Don't overlook the possibilities of . . .

S. S. WHITE FLEXIBLE SHAFTS

SOME AUTOMOTIVE APPLICATIONS OF S. S. WHITE SHAFTS

REMOTE CONTROL
- Choke Valves
- Clock Setting
- Drain Valves
- Engine Governors
- Mileage Reset
- Radios
- Radio Antennas
- Spotlights

POWER DRIVE
- Movable Tops
- Speedometers
- Taximeters
- Truck Recorders
- Windshield Wipers

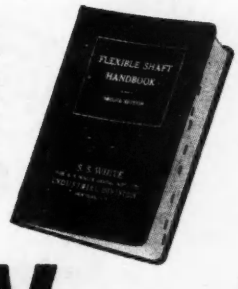
In S. S. White Flexible Shafts you have at your disposal basic mechanical elements for transmitting power and for remote control between any two points—elements which can be run inconspicuously from one point to the other. Their use gives you this big advantage—it enables you to place driven or controlled instruments or accessories wherever you want to put them to satisfy space conditions or to make them easy to install, to operate and to service.

Also, with S. S. White Flexible Shafts you can readily take off power from the engine for driving accessories as is done in aircraft, or from the transmission. With S. S. White Flexible Shafts you can bring heating, air conditioning, radio or other controls to any one or more points in the car.

The use of S. S. White Flexible Shafts in motor vehicles is, of course, not new. Applications in pre-war cars, buses and trucks —and today in jeeps, tanks, trucks and other war vehicles—runs to millions of feet annually. Bear them in mind for they may well be the answer to some of the problems in your development of new car models.

GET THE COMPLETE FACTS ABOUT FLEXIBLE SHAFTS IN THIS FREE 256-PAGE HANDBOOK

It contains all essential technical data and explains how to select and apply flexible shafts for specific requirements. A copy will be sent free if you write for it direct to us on your business letterhead and indicate your position.



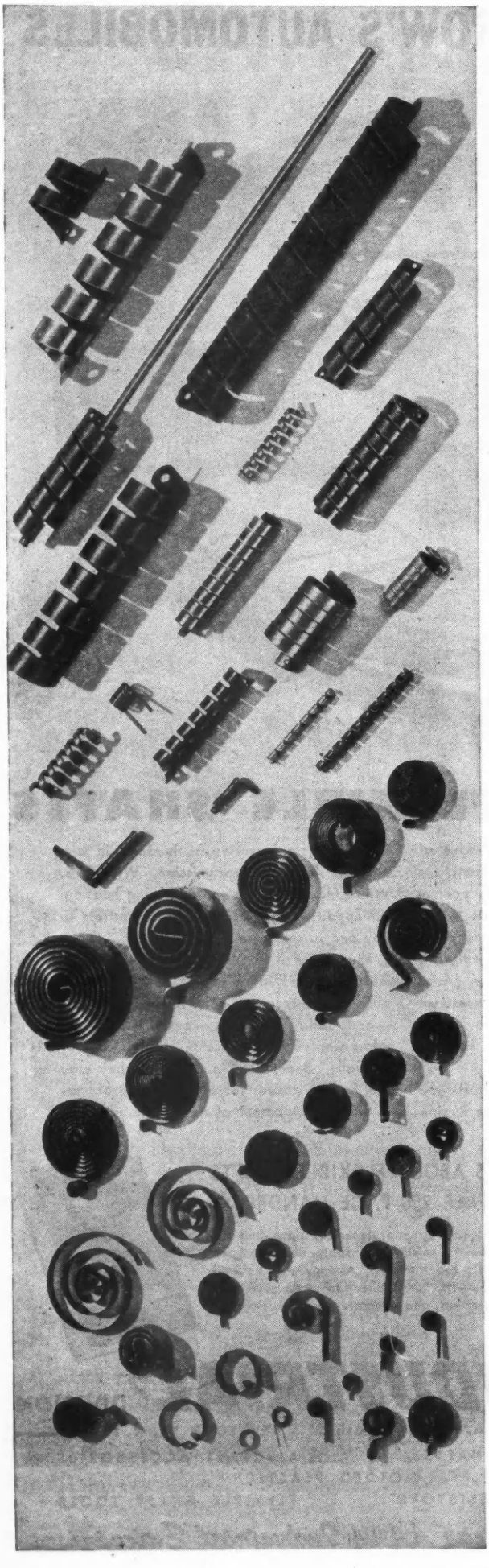
S.S.WHITE INDUSTRIAL DIVISION

THE S. S. WHITE DENTAL MFG. CO.

DEPT. A, 10 EAST 40th ST., NEW YORK 16, N. Y.

FLEXIBLE SHAFTS — AIRCRAFT ACCESSORIES
MOLDED PLASTICS
MOLDED RESISTORS — FLEXIBLE SHAFT TOOLS

One of America's AAAA Industrial Enterprises



ANOTHER WILCO DEVELOPMENT

WILCO THERMOMETAL (Thermostatic Bimetal)

Morflex

Higher Deflection Rate • Greater Electrical Resistivity

This new high action WILCO Thermometal broadens the range of Thermostatic Bimetal application.

PROPERTIES AND CHARACTERISTICS—Morflex provides a 40% higher temperature deflection and electrical resistivity for devices or instruments requiring extremely high sensitivity from 50° to 350°F. Whether the desired function is Temperature Indication, Temperature Control, or Temperature Compensation, Morflex operates dependably and uniformly . . . saves space.

WIDE APPLICATION FOR DOMESTIC AND INDUSTRIAL DEVICES—Morflex is supplied in strip or in straight cantilever blades, U-shapes, spirals and helices . . . or as parts of assemblies with shafts, studs, brackets, contacts, braids or springs.

CONSULT OUR ENGINEERING DEPARTMENT—Write the WILCO Engineering Department for help in developing the proper application of WILCO materials to your products. Send for FREE copy of the WILCO Blue Book. It contains charts, formulae, and full descriptions of *all* WILCO Thermometals and other products:

WILCO PRODUCTS INCLUDE:

CONTACTS—
Silver
Platinum
Tungsten
Alloys
Sintered Powder Metal

THERMOSTATIC BIMETAL—
High and Low Temperature with new high temperature deflection rates.

PRECIOUS METAL COLLECTOR RINGS—
For rotating controls

SILVER CLAD STEEL JACKETED WIRE—
Silver on Steel, Copper, Invar or other combinations requested.

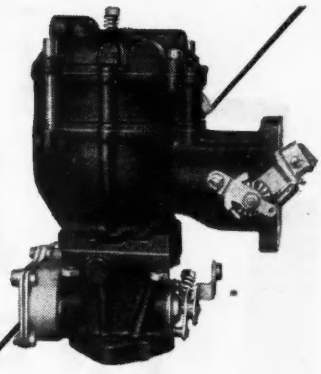
ROLLED GOLD PLATE

SPECIAL MATERIALS

THE H. A. WILSON COMPANY
105 Chestnut Street, Newark 5, N. J.
Branch Offices: Chicago—Detroit—Los Angeles

SPECIALISTS FOR 30 YEARS IN THE MANUFACTURE OF THERMOMETALS • ELECTRICAL CONTACTS • PRECIOUS METAL BIMETALLIC PRODUCTS

when you specify ZENITH



you get 30 years of specialized experience

in heavy-duty carburetion

Twice tried and proved on the world's toughest proving ground World War I and II

Engine performance is vitally dependent on efficient and reliable carburetion. That's why it is important to remember that Zenith* Carburetor Division has more specialized experience in the field of heavy-duty carburetion than any other manufacturer.

Since almost the beginning of the bus and truck industry in this country, Zenith has been a recognized leader in research, engineering and mass production of advanced type carburetion *specially built for heavy-duty use.*

Millions of engines are operating with greater power, greater economy and greater efficiency on trucks, buses and industrial installations because of Zenith's specialized experience.

Take full advantage of Zenith knowledge in designing your equipment. Zenith engineers are at your service. Call or write.

*REG. U. S. PAT. OFF

ZENITH CARBURETOR DIVISION

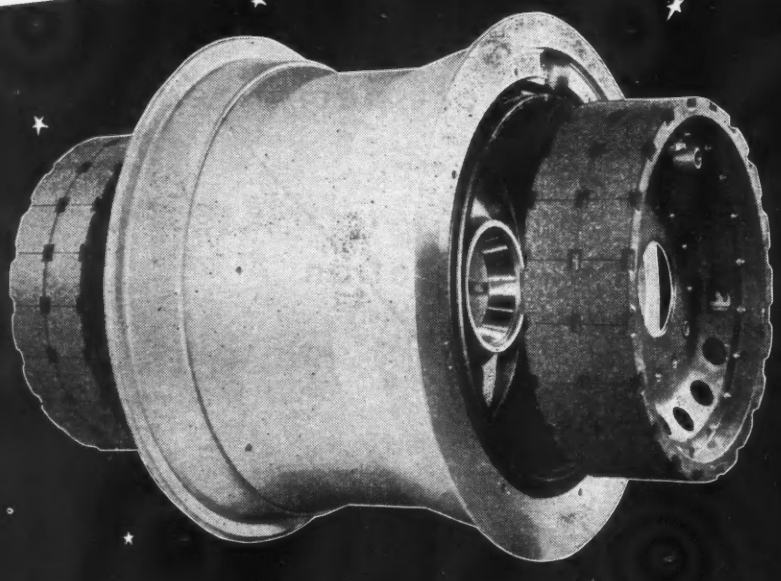
696 Hart Avenue, Detroit 14, Michigan

PRODUCT OF Bendix AVIATION CORPORATION

ARMY E NAVY

HAYES INDUSTRIES

BOEING
CESSNA
CHANCE VOUGHT
CONSOLIDATED VULTEE
COLUMBIA
CURTISS WRIGHT
DOUGLAS
EDO
ERCOUPE



FAIRCHILD
GRUMMAN
LOCKHEED
MARTIN
NORTH AMERICAN
PIPER
STINSON
WACO

CONTINENTAL
EASTERN
PCA
UNITED
WESTERN
Air Lines

over 1,200,000 WHEELS AND BRAKES

While war wings its way farther toward victory—Hayes Industries offers our military, naval and civilian forces a record of *not one day's production lost* since defense work started and war's grim demands followed.

In this time—well over 1,200,000 Hayes Industries aircraft wheels and brakes have moved onto the world's runways—keeping pace with training, transport and combat needs... meeting ever-higher loadings and landing speeds... doing the job the builders want and the pilots and ground crews expect... and get!

All U.S. 4-Engine Bombers, including BOEING B-17 and B-29 and CONSOLIDATED B-24, and transports such as CURTISS C-46, are equipped with Hayes Wheels and EXPANDER TUBE BRAKES.

Western Representative: Airsupply Co., 5959 W. 3rd St., Los Angeles 36, Calif.

HAYES INDUSTRIES, INC. ★ Home Office: JACKSON, MICHIGAN, U.S.A.

Have you ever watched the production line in a modern industry? Did you note the ease and the speed with which the motive units were assembled? The factor that makes this possible is the uniformity of parts. In mass production, like parts must be interchangeable.

Sleeve Bearings as produced by Johnson Bronze are a good example. It makes little difference whether the order calls for one hundred or one million . . . each bearing is produced exactly according to specifications. The alloy . . . the tolerance . . . the finish are correct in every respect.

This close attention to detail on our part saves manufacturers considerable money plus many precious hours of assembly time. Isn't this the type of bearing service you require? Why not call us in today?

JOHNSON BRONZE CO.

625 S. MILL STREET NEW CASTLE, PA.

VICTORY
COMES FIRST
All our present production is for Armament

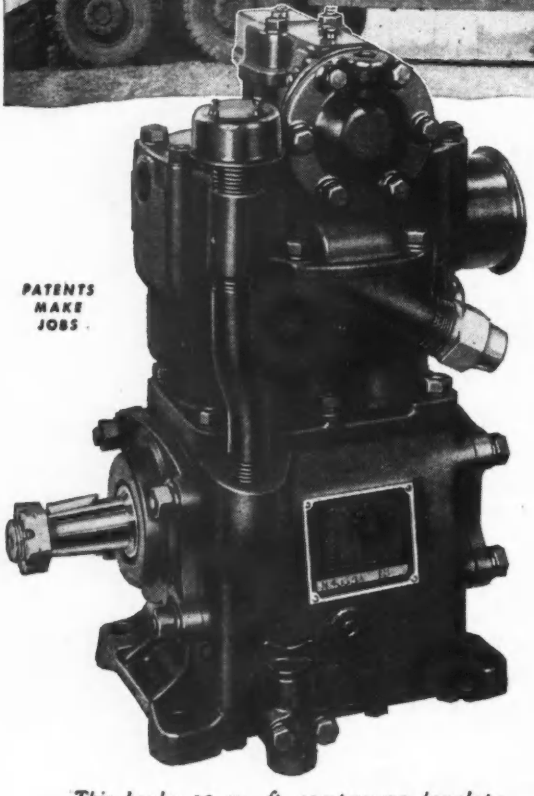
JOHNSON
SLEEVE BEARING HEADQUARTERS
BRONZE

BRANCHES IN 18 INDUSTRIAL CENTERS

MIDLAND AIR BRAKES

Stop This 76-Ton Load

PATENTS MAKE JOBS



This husky 10 cu. ft. compressor develops tremendous braking power — makes Midland Air Brakes dependable under all circumstances.

● This is the United States Army M-15 truck and semi-trailer, used to transport General Sherman 33-ton tanks. It is manufactured by Fruehauf Trailer Company at their Fort Wayne, Indiana, plant. Total weight of truck, trailer and tank is 76 tons.

The M-15 trailer is equipped with Midland Air Brakes powered by the big new 10 cu. ft compressor.

This same husky compressor, which furnishes the power to stop this 76-ton load, is the heart of Midland Air Brake systems now being supplied for many trucks. It assures you absolute braking dependability, safety and long, economical service.

THE MIDLAND STEEL PRODUCTS CO.

10603 MADISON AVE. • CLEVELAND 1, OHIO

Export Department: 38 Pearl Street, New York City

NOTE: A newly acquired plant makes it possible for us to consider the postwar manufacture of a few items in household or office appliance, automotive or mechanical fields, in small or medium size fabrications. We invite inquiries to MIDLAND NEW PRODUCTS DEPT., 10603 Madison Ave., Cleveland 1, Ohio.

MIDLAND

CHRISTENSEN

POWER BRAKES

VAPOR DEGREASING

WITH TRICHLORETHYLENE!

This efficient cleaning method speeds production—saves cost!

1. Thoroughly removes grease and oil from metal parts of any size or shape, often in less than one minute.

2. Produces parts clean, warm and dry—ready for inspection, assembly, further fabrication or finishing of any type.

3. Minimizes finishing rejects because solvent reaches and removes grease and oil from deep draws, holes and almost inaccessible places.

4. Reduces risk of damage to delicate parts.

5. Can be used alone or as a part of a process flow line.

6. Utilizes compact equipment.

7. Consumes only small quantities of solvent. Contaminated solvent is reclaimed economically.

8. Uses absolutely pure vapors of a non-flammable solvent as a cleaning medium.

9. Simplifies cleaning procedure, is easy to operate as a process.

10. Saves time and cost in its own operation, and in the subsequent handling and finishing of parts.

BEFORE THESE—and before and after many other fabricating and finishing steps, Vapor Degreasing yields parts clean, warm and dry, ready for the next operation. It's quick—efficient—effective. Its only tools are specially designed equipment and degreasing grades of Trichlorethylene or Perchlorethylene. And Vapor Degreasing speeds production and saves cost.

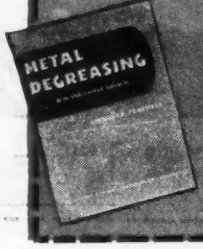
Clip the coupon below for your free copy of our new, illustrated book, "Metal Degreasing—Standard Practices."

E. I. DU PONT DE NEMOURS & CO. (INC.)
Electrochemicals Department
Wilmington 98, Delaware

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY
SPEED VICTORY—BUY BONDS!

CLIP THIS COUPON



E. I. du Pont de Nemours & Co. (Inc.)
Electrochemicals Department
Wilmington 98, Delaware

Please send me my copy of "METAL DEGREASING—STANDARD PRACTICES."

Name _____ Position _____

Firm _____

Address _____

NOTHING LIKE BEING PREPARED!

Even a carefree youngster knows the value of preparedness! Then surely a production-minded shopman should at all times be prepared for emergencies.

You never can tell when a milling machine arbor might suddenly break down, causing vital production schedules to be disrupted and machine hours wasted. So be prepared! Keep several spare arbors on hand for emergencies. Remember, arbors are classed as "perishable tools" and their cost today is relatively small.

Kempsmith Arbors in all popular sizes and types are regularly carried in stock. Every one is a precision-built tool, adaptable to ANY make of milling machine equipped with standardized spindle. Fill in and mail coupon for bulletin.

THE KEMPSMITH MACHINE CO.
1825 S. 71st Street • Milwaukee 14, Wis., U. S. A.

Kempsmith Arbors are backed by more than a half century of specialized experience in designing and producing rugged milling machines and accessories.

Buy Your Arbors from an Arbor Specialist

KEMPSMITH

Precision Built Milling Machines Since 1888

Write Today!

KEMPSMITH — Yes, I would like to receive a copy of your new Arbor Bulletin:

NAME..... TITLE.....

FIRM..... ADDRESS.....

CATERPILLAR
Twin Coach
Superior
DODGE
HARVESTER
GMC TRUCK
PACKARD
BUDA
MURPHY DIESEL
Cletrac
Mack
Studebaker
Autocar
GENERAL MOTORS LOCOMOTIVES
HERCULES
White
WAUKESHA
DIAMOND T
GM GENERAL MOTORS DIESEL POWER
FEDERAL
CUMMINS

TOCCO... the sign of

5 TO 10 TIMES LONGER LIFE

AN engine's crankshaft is its *sinew of power.* Is it any wonder that engine builders pay strictest attention to this vital part . . . for utmost wearability and strength?

Millions of crankshafts, surface hardened by TOCCO Electrical Induction, are contributing to the stamina of the above makes of engines . . . lasting 5 to 10 times longer than shafts which are not surface hardened.

One of these manufacturers reports locomotive service records of 1,000,000 miles—the equivalent of 40 times around the world—with only .001" wear on a TOCCO-Hardened crankshaft . . . Another reports only .0025" wear after 230,000 miles of gruelling trucking service.

TOCCO-Hardened crankshafts give this kind of service because:

TOCCO hardens the *wearing surface* only . . . does not affect the shaft core. Hence:

It produces *superhardness* for greater wear resistance and . . .

It preserves the previous *strength and ductility* to withstand higher pressures and speeds.

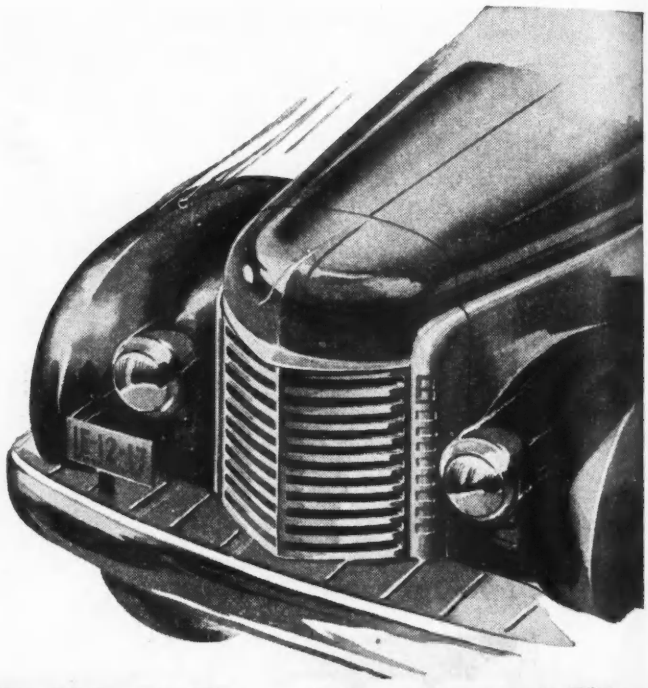
Similar stamina and performance can be expected from TOCCO-Hardened parts of all kinds. Find out how you can *improve your products and cut your costs* with TOCCO Induction Heating. New book of case studies, free on request. Ask for Bul. 14.

THE OHIO CRANKSHAFT COMPANY, Dept. A • Cleveland 1, Ohio

TOCCO

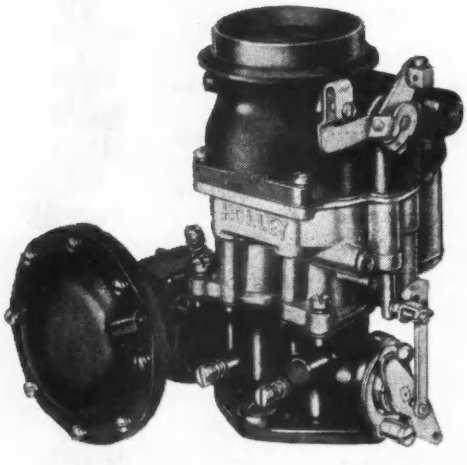
INDUCTION
HARDENING, BRAZING
ANNEALING, HEATING

Protect your New Truck with



Holley CENTRI-VAC

- **Reduces Accidents**
- **Saves Engine Wear**
- **Cuts Fuel Costs**



Protection of expensive motor truck equipment is one of the most important factors in efficient, profitable operation, both now and postwar. HOLLEY CENTRI-VAC is engineered to provide this protection without sacrificing quick, positive acceleration and other desirable operating qualities. This new governor principle controls engine speed without surging, loss of power or sluggish pickup.

Conserve equipment, reduce accidents and cut operating and maintenance costs with CENTRI-VAC control. While providing greater safety, CENTRI-VAC assures more constant speed, which makes for faster schedules and better road time.

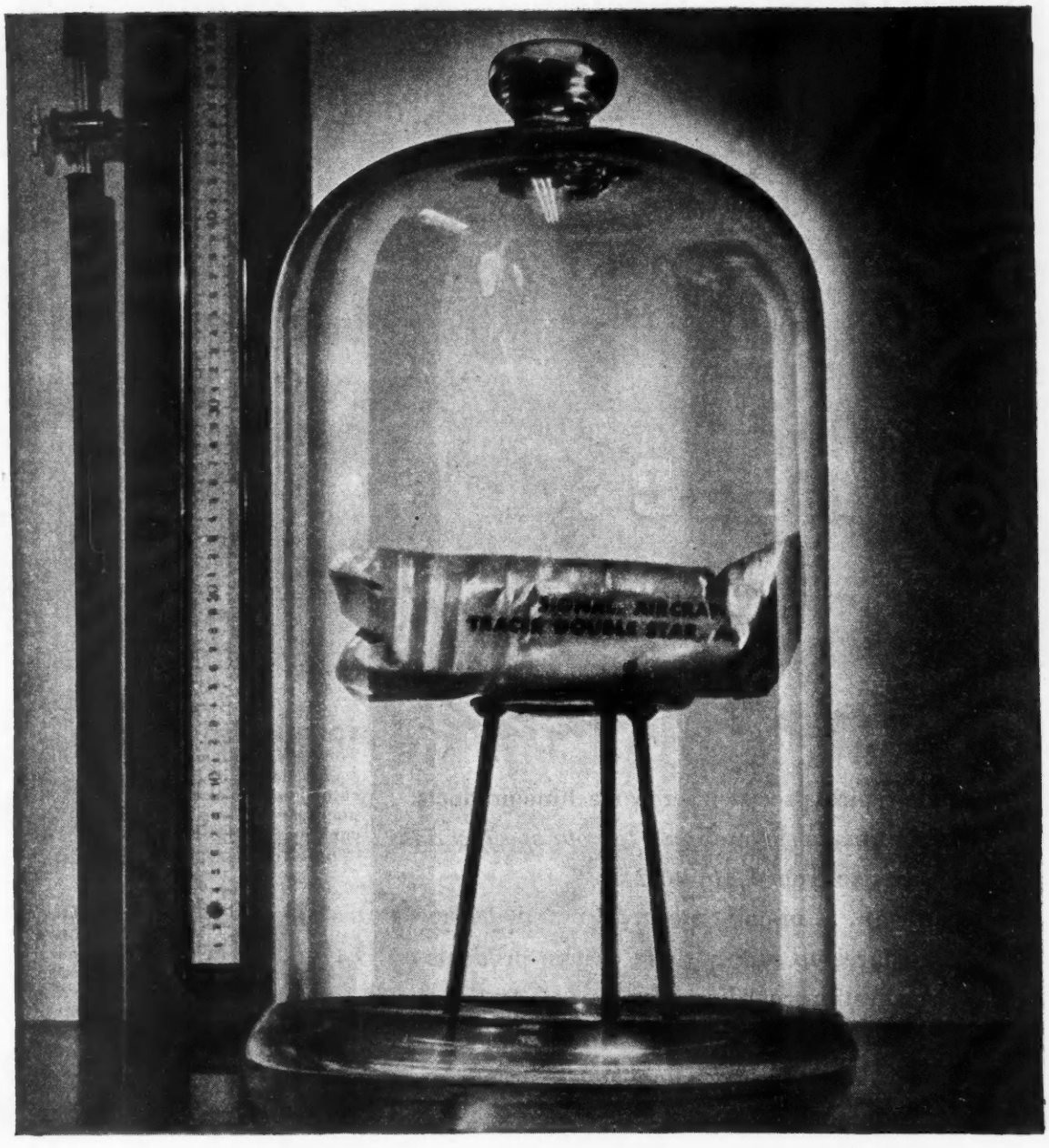
Investigate CENTRI-VAC'S extra safety factors, low cost and easy installation . . . write today for complete information and comprehensive engineering data.

HOLLEY CARBURETOR COMPANY
5930 Vancouver Avenue, Detroit 4, Michigan

HOLLEY

AIRCRAFT • AUTOMOTIVE • MARINE
CARBURETORS AND ACCESSORIES

You're looking at the substratosphere !



Yes—it's just a bell jar. But the air pressure in it duplicates the atmosphere 8 miles above the earth.

The test being made helps determine the packaging specifications for the life-saving flares carried in high-altitude bombers. It is one of hundreds of checks and counter-checks made daily in Reynolds Laboratory.

There are twelve highly specialized departments in Reynolds completely equipped, modern packaging laboratory . . . dedicated now to the single aim of developing better packaging for shipment of the matériel of war.

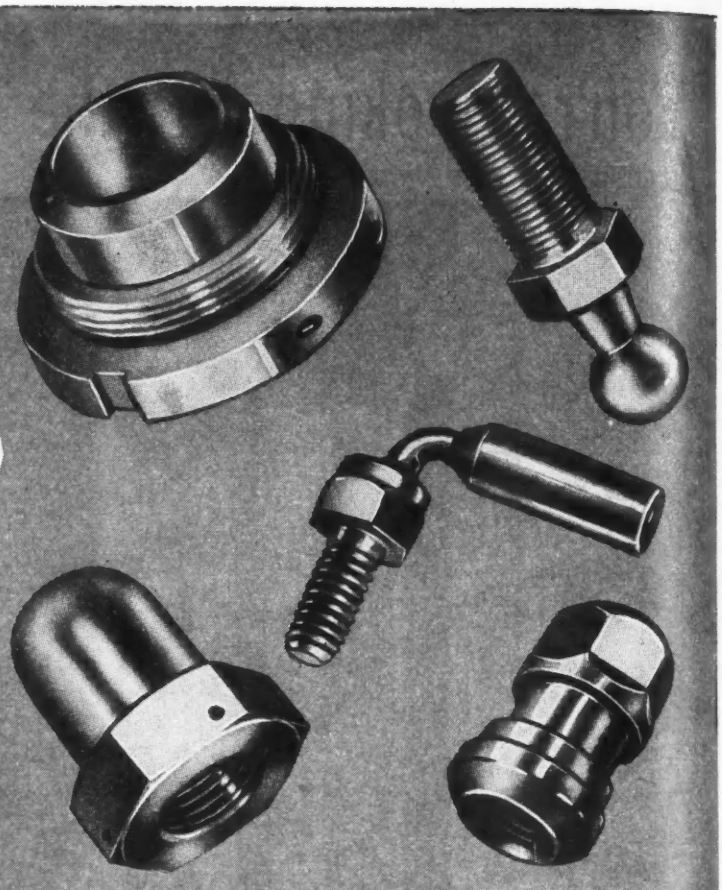
The needs of war have brought about packaging miracles! Undreamed of improvements have been made in the rolling, laminating and sealing of foil materials.

If you are interested in knowing how these new developments can help deliver your products to the public in better condition and with greater sales appeal than ever before—Reynolds technicians will be glad to tell you.

For 25 years the world's largest producer of foil!
Address inquiries to Reynolds Metals Co., Reynolds Metals Building, Richmond 19, Virginia.

REYNOLDS METALS COMPANY
Leads the way in Foil Packaging

Need Parts Like These?

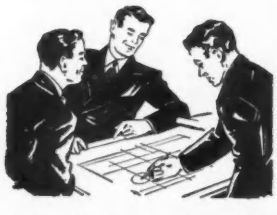


Come to Tourek

These are typical precision screw machine products. Tourek can make them *exactly to your specifications* . . . in any size from 1/16" to 2 5/8". . . in any metal . . . in any quantity. Here at Tourek to supply these custom products is an organization coordinated to serve. An organization complete and modern in *equipment* . . . ingenious in *engineering "know-how"*. . . and rich in manufacturing *experience.*

Although present production demands are today engaging our facilities, we are eager to serve you. Why not consult us—particularly on your postwar screw machine products problems?

TOUREK'S EQUIPMENT
Tourek's modern plant is equipped with the latest model automatic screw machines, all necessary supplementary equipment and complete tool room facilities.



TOUREK'S INGENUITY
Tourek's Engineering Staff works closely with you to devise the most effective design and economical production of precision parts.

TOUREK'S EXPERIENCE
To the solution of your special problems Tourek brings to bear nearly a quarter of a century of successful, volume manufacture of screw machine parts of the most intricate design and precise dimensions.

J. J. TOUREK MFG. CO.
4701 W. 16th Street Chicago 50, Illinois

MAKERS OF THE FAMOUS TOUREK BALL JOINTS

ESTABLISHED 1920

TOUREK

PRECISION SCREW MACHINE PRODUCTS

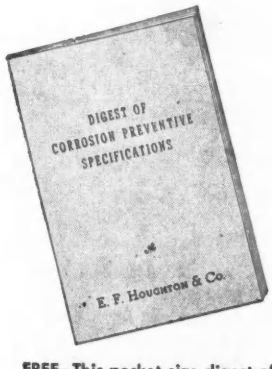
RIGHT NOW!

...Prepare to rust-protect your war machinery before storage

Either government-owned equipment or your own war machines will have to be carefully protected against corrosion before they can be moved out to make room for peace-time manufacturing.

Even though that great day may not have actually arrived, it's time to prepare for it, *right now,* so you will not have a last-minute shortage of the necessary materials. It will take time to collect the lumber, paper, containers and rust preventives needed to fulfill Uncle Sam's published packaging instructions.

That's a big job—one that will be made easier by a talk with the Houghton Man, who knows how others are handling it, preferred methods of application, and information on the various preventives we supply to meet these specifications. Our 70-year experience in fighting rust is at your service. E. F. HOUGHTON & CO., 303 W. Lehigh Ave., Philadelphia, and all principal cities.



FREE—This pocket-size digest of the principal corrosion preventive "specs" for which Houghton supplies approved products.

Houghton's RUST Preventives

JESSOP

COLD DRAWN—CENTERLESS GROUND

BAR STEELS

Jessop Specialty Steels are produced with meticulous care, under the most advanced principles and discoveries of Metallurgy—in plants equipped with modern facilities—by generations of experience in Steel Making.

Jessop Cold Drawn Steels have a smooth surface, are accurate to size and section, held within close tolerances, and have materially increased physical properties, particularly the yield point. We produce centerless ground rounds, also centerless ground and polished with real bright finish with close accuracy to size and free from decarburization and surface defects.

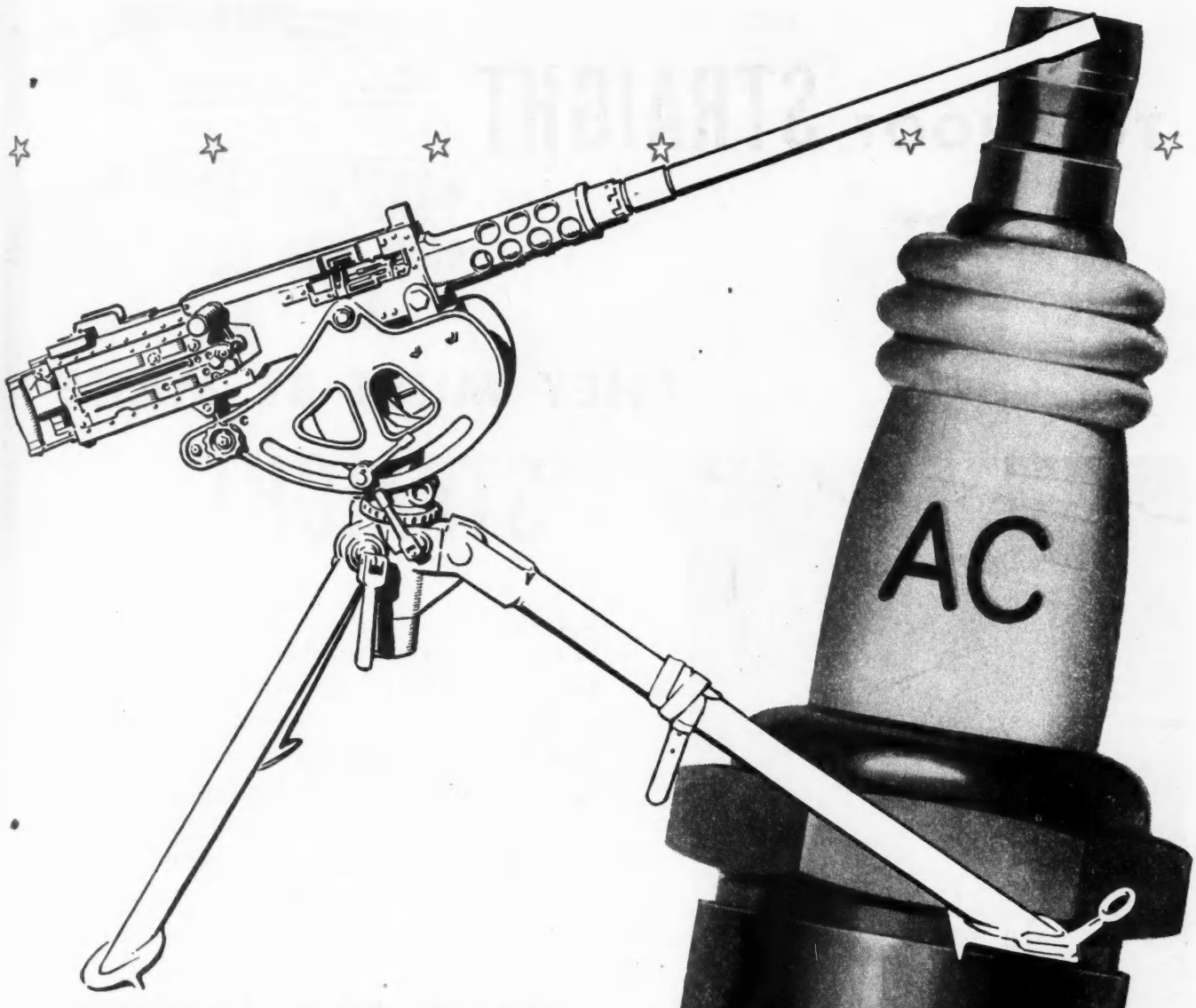
AVAILABLE IN:

- Drill Rod
- Carbon and Alloy Tool Steel
- Stainless Steel
- Non-Magnetic Steel
- Valve Steel
- "New Process" Cold Header Die Steel
- Jessop "B" Bearing Steel
- Jessop "Extra Tough" Grades
- Special Purpose Steels
- Centerless Ground High Speed Steel
- Cold Drawn "Tip-it" Shank
- Cold Drawn Special Shapes

Deliveries from warehouses and mills. Write for literature on material in which you are interested.

JESSOP Steel Company

Head Office and Works • **WASHINGTON, PA.**



UNDER WAR-TIME CONDITIONS

AC's production of purely military devices is going forward, side by side with *war* production of what were formerly *peace-time* automotive products. Combined, the number of articles exceeds 450.

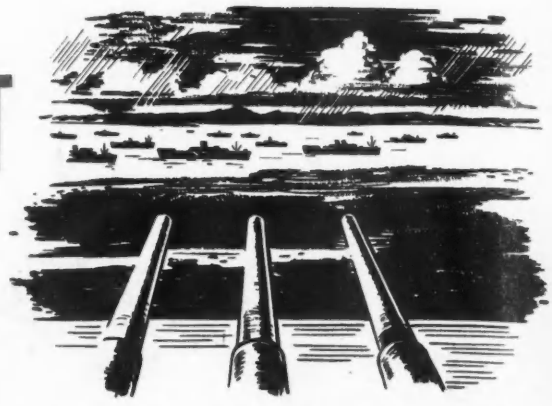
AC experience and "know how" are at work on both kinds of products. So, those two intangible factors,—which made AC products valuable to automotive manufacturers before Pearl Harbor,—are being kept live and active while war continues.

BUY MORE THAN EVER IN THE 7TH WAR BOND DRIVE

AC SPARK PLUG DIVISION — GENERAL MOTORS CORPORATION

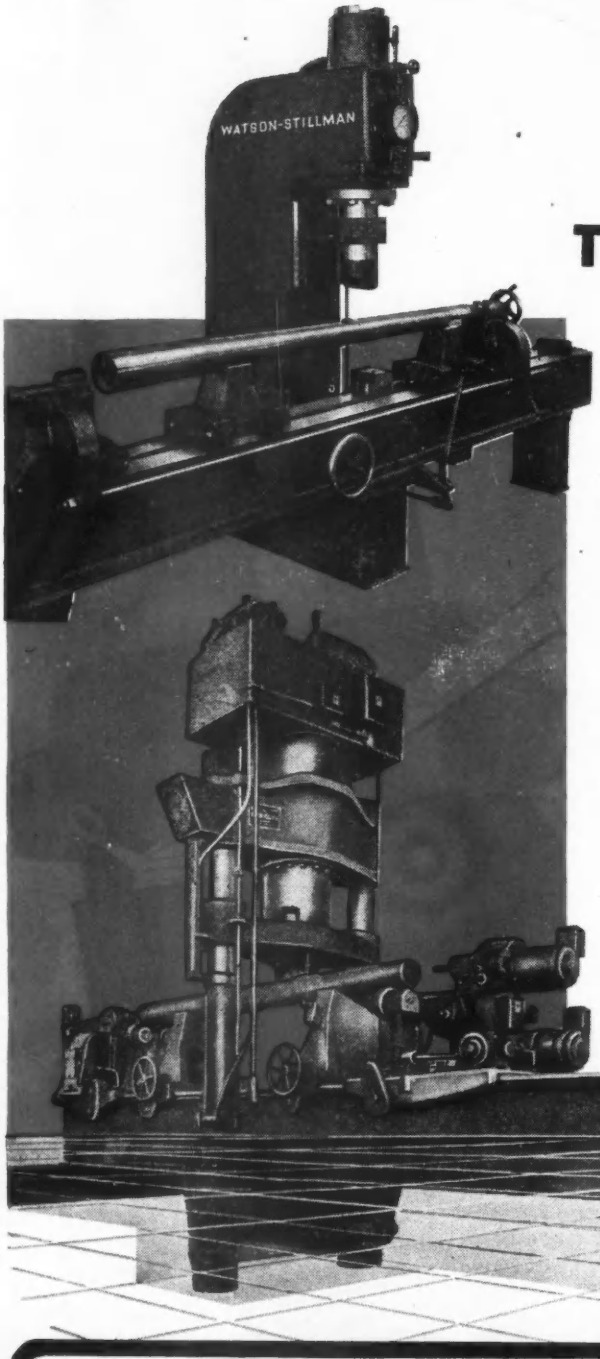
AIRCRAFT SPARK PLUGS • AIR CLEANERS • AMMETERS • CARBURETOR INTAKE SILENCERS • CARBURETOR INTAKE SILENCER AND AIR CLEANERS • DIE CASTINGS • DIE CASTING MACHINES • FLAME ARRESTERS • FLEXIBLE SHAFTS AND CABLES FUEL OIL FILTERS • FUEL PUMPS • FUEL AND VACUUM PUMPS • GASOLINE GAUGES • GASOLINE STRAINERS • ENGINE BEARINGS • IGNITION CABLE TERMINALS • INSTRUMENT PANELS • LUBRICATING OIL FILTERS • OIL FILTER REPLACEMENT ELEMENTS AND CARTRIDGES • AIR GAUGES • OIL GAUGES • RADIATOR PRESSURE CAPS • REPLACEABLE AIR CLEANER ELEMENTS • AUTOMOTIVE SPARK PLUGS • SPARK PLUG CLEANERS • SPARK PLUG GAPPING TOOLS • SPARK PLUG TESTERS • SPEEDOMETERS • SPEEDOMETER CABLES • TACHOMETERS • THERMO GAUGES • VACUUM PUMPS

TO SHOOT STRAIGHT



THEY MUST BE MADE

STRAIGHT



THE SUCCESSFUL record our Navy has made testifies to the skill of our gunners — and the perfection of our equipment. In the various mechanical operations of making a gun barrel, none is more important than straightening — just before the rifling is cut. For this operation, Watson-Stillman Straightening and Bending Presses — ranging in capacity from 20 tons (for straightening machine gun barrels) to 1000 tons (for straightening larger naval guns) — are used with precise results.

Only two of the latest W-S Straightening Presses are shown here. Bulletin No. 320-A gives complete information — specifications, engineering data and illustrations — on the entire line of W-S Straightening and Bending Presses.

1745

WATSON-STILLMAN
HYDRAULIC MACHINERY DIVISION

FACTORY & MAIN OFFICE: ROSELLE, NEW JERSEY

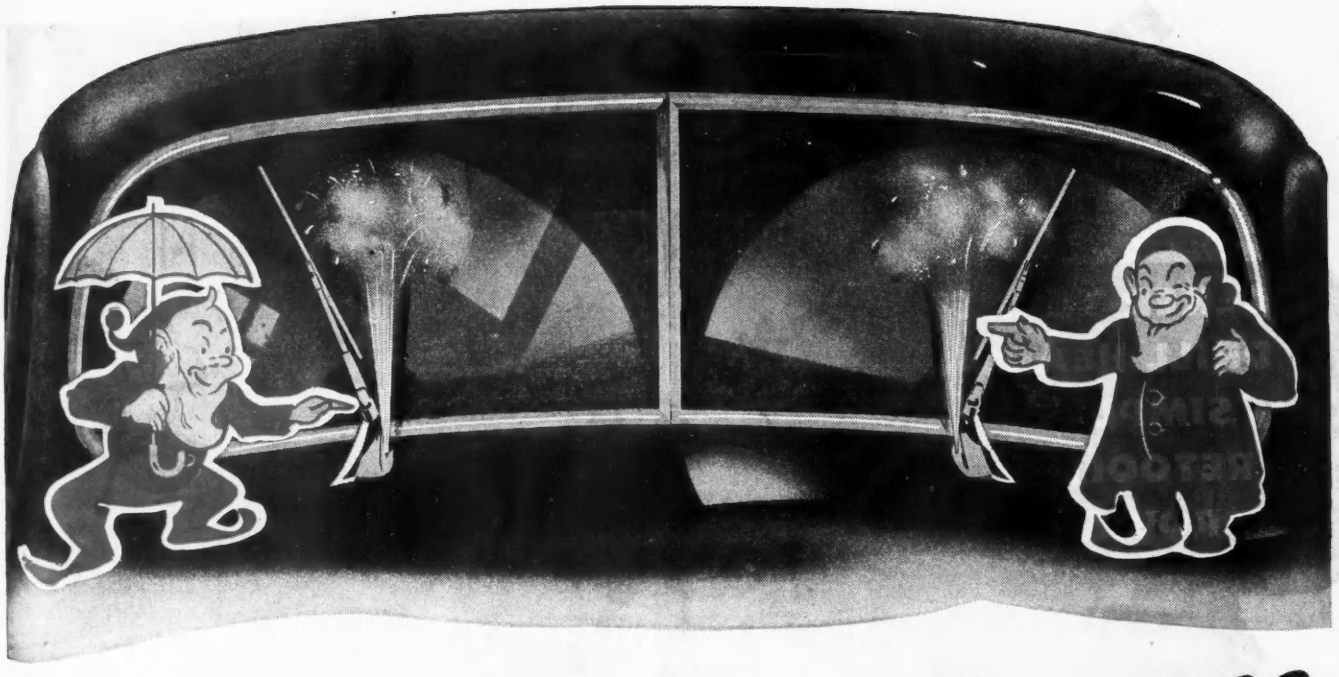
Branch Offices

WASHINGTON, D. C. • NEW HAVEN, CONN.
PHILADELPHIA, PA. • CHICAGO, ILL.

REPRESENTATIVES

WASHINGTON, D. C. ..... Ralph Payne (R. R. Equip.)	PITTSBURGH, PA. ..... Laird and Johnston
INDIANAPOLIS, IND. ..... W. K. Millholland Machinery Co.	CLEVELAND, OHIO ..... The Cleveland Duplex Machinery Co.
CHICAGO, ILL. ..... E. L. Essley Machinery Co.	DETROIT, MICH. ..... Peninsular Machinery Co.
MILWAUKEE, WISC. ..... E. L. Essley Machinery Co.	GRAND RAPIDS, MICH. ..... E. L. Essley Machinery Co.
ST. PAUL, MINN. ..... Anderson Machine Tool Co.	LOS ANGELES, CAL. ..... Smith Booth Usher Co.
SAN FRANCISCO, CAL. ..... Jenison Machinery Co.	SEATTLE, WASH. ..... Star Machinery Co.

CANADA: Canadian Fairbanks-Morse Co., Ltd.
Branches in All Principal Cities



RAIN or SHINE these two little SQUIRTS

wash your windshield WHILE YOU DRIVE

● The Trico Automatic Windshield Washer squirts two jets of water on the windshield for 16 seconds — when you want it while you drive.

The Washer makes your Wiper Blades useful in dry weather as well as wet.

In sprays of light rain, the Washer supplements — to clean the windshield quickly. And in dry weather, off goes dazzling dust and blinding grime.

Pre-war installations made driving easier on the eyes — and safer for thousands. Now ready for the cars of tomorrow is the further improved Trico Washer with new clog-proof jet control.

Operates automatically by vacuum.

TRICO PRODUCTS CORPORATION
BUFFALO 3, NEW YORK

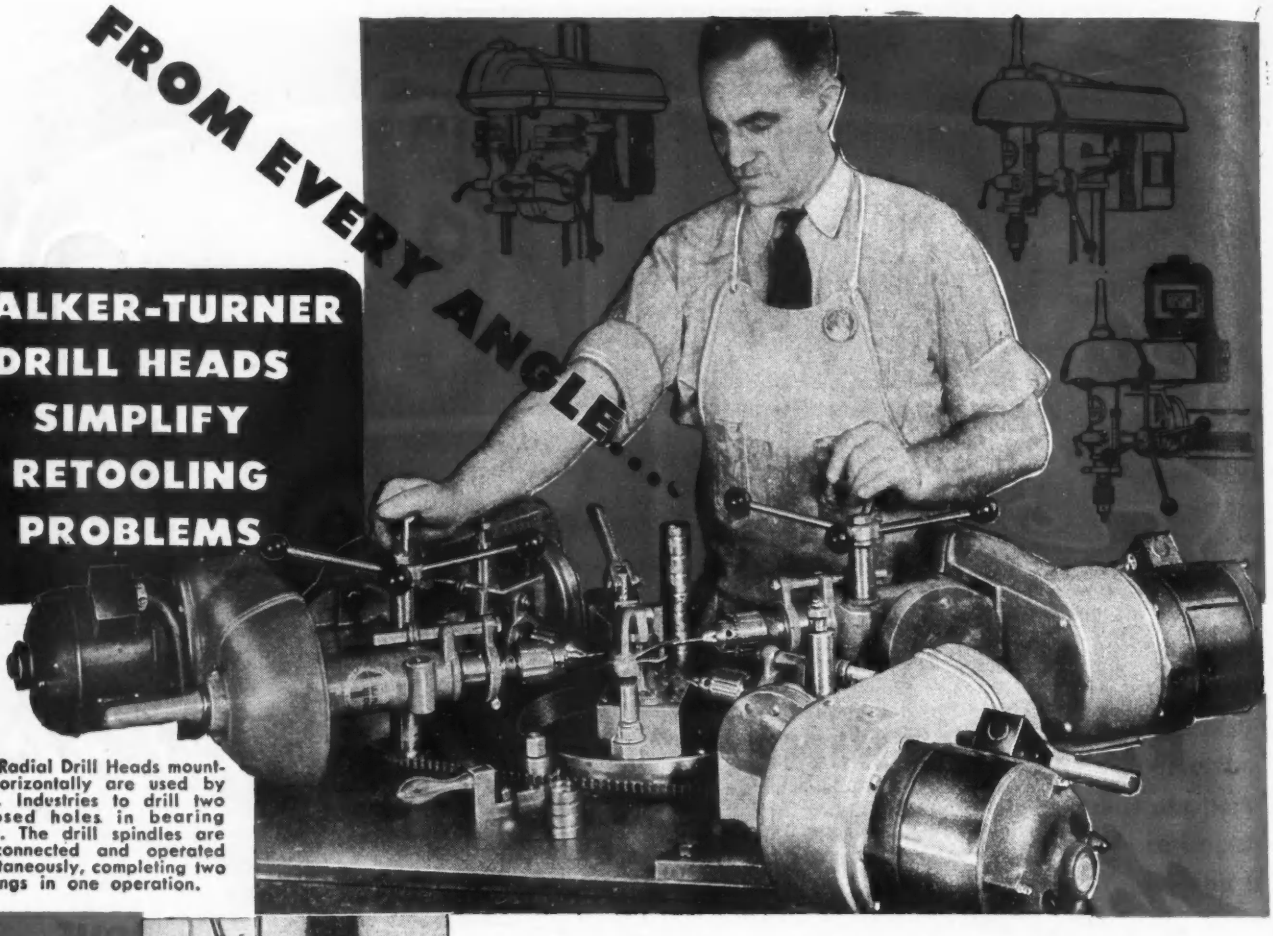
Manufacturers of vacuum-operated products, including automatic wipers used as standard equipment on millions of cars for 25 years, and of precision gauges (Micro-Chek) for 3800 war industries.

BUY AND KEEP WAR BONDS

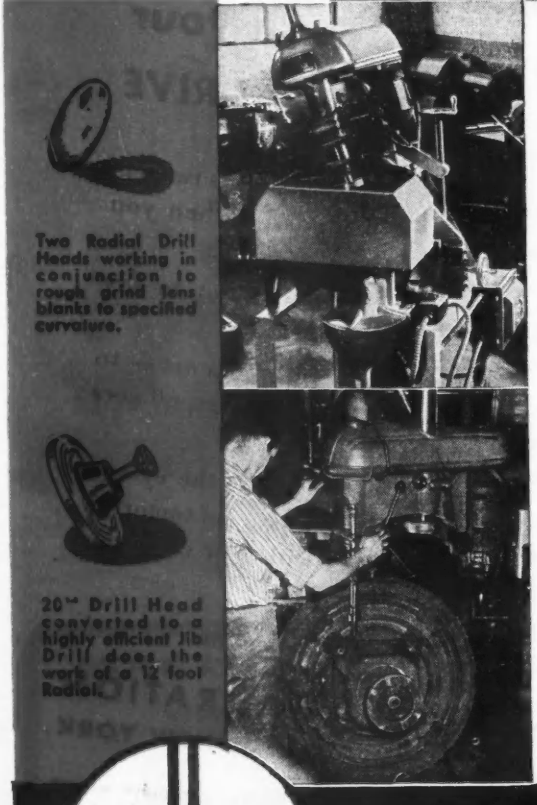
Also for
POST-WAR CARS—the
TRICO
Lift-O-Matic
FINGER-TIP CONTROL FOR CAR WINDOWS

FROM EVERY ANGLE...

WALKER-TURNER DRILL HEADS SIMPLIFY RETOOLING PROBLEMS



Four Radial Drill Heads mounted horizontally are used by S.K.F. Industries to drill two opposed holes in bearing races. The drill spindles are interconnected and operated simultaneously, completing two bushings in one operation.



Two Radial Drill Heads working in conjunction to rough grind lens blanks to specified curvature.

20" Drill Head converted to a highly efficient Jib Drill does the work of a 12 foot Radial.

Check These High Spots:

- Operate vertically, horizontally, at any angle — even upside down.
- Careful selection of materials, superior design, rugged construction, assure long service at high level of precision.
- Speed ranges from 85 to 8300 R.P.M.
- Safe, simplified operation.
- Low initial cost—low power consumption—low maintenance.
- Handle Metals, Plastics, Wood, Ceramics, Glass.

For a faster reconversion when the time arrives, it will pay you to look into the tooling possibilities of Walker-Turner Drill Heads, *now!*

Compact, flexible Walker-Turner Drill Heads are available in 20" models (hand or power feed) and 15" models (hand feed or radial). Four ball bearings on splined spindles—full floating spindle pulley — one-piece head casting—many other features—maintain high production and precision, while slashing costs!

WRITE TODAY FOR FREE, FACTUAL DRILL HEAD FOLDER — shows typical special tooling set-ups — construction details — cutaway drawings — prices.

WALKER-TURNER CO., INC., PLAINFIELD, N. J.

walker-turner
COMPANY, INC.
PLAINFIELD, N.J.
U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

TO DESIGNERS AND ENGINEERS:

An Interesting Proposition

UNUSUAL DESIGN IN STEEL = *The USUAL THING at SPUN STEEL*

SPUN STEEL engineers make their primary work the development of drive and driven pulleys for special applications. Spun Steel production centers around the exclusive automatic roller-forming process which insures balance, concentricity, and smooth effective belt surfaces on all SPUNSTEEL single and multiple V-groove pulleys. Precision tolerances are maintained.

Equipment and minds at SPUN STEEL are flexible. Here war production is speeded by unusual application of stamping, brazing, welding, and roller-forming techniques. Your problems can be met with our continuing ready interest and increased knowledge. Write, outlining your needs, enclosing blueprints if you have them, desk-pad doodles if you don't!

METAL ENGINEERING WORKS WONDERS IN STEEL

Heavy, costly, machined parts using bar stock or forgings have been — and can be—replaced by Spun Steel designs for assemblies of stampings. Colorful 6 page brochure tells in text and pictures how you can reduce your costs, speed production with "Metal Engineering." Write today!

THE Spun Steel CORPORATION

2040 DUEBER AVENUE, S. W., CANTON 6, OHIO

SPUNSTEEL

A Handful of Reasons

WHY Wells No. 8

IS A WISE INVESTMENT

The Wells will cut most any shape, size or type metal you can get into it. It will take overall sizes up to 8" x 16" rectangles and 8" rounds, solid stock, tubing or structural steel.

Because the Wells is portable you can move the saw to the work and save time and labor in so doing.

Gravity feed and automatic shut-off enables one man to operate two or more Wells Saws. Even an inexperienced operator can do a lot of work with this simple handy tool.

Low in first cost, uses little power, requires little maintenance. Saves money, time, labor, steps up production.

Ruggedly constructed of quality materials, with a minimum of moving parts, the Wells will deliver years of faithful, efficient metal cutting.

SPECIFICATIONS

CAPACITY:
Rectangular . . 8" x 16"
(Special Guides) 5" x 24"

ROUNDS: . 8" diameter

MOTOR:
½ H. P., A. C. or D. C.

SPEEDS: Selective 60, 90, 130 feet per minute

WEIGHT:
Approximately 750 lbs.

Wells SAWS

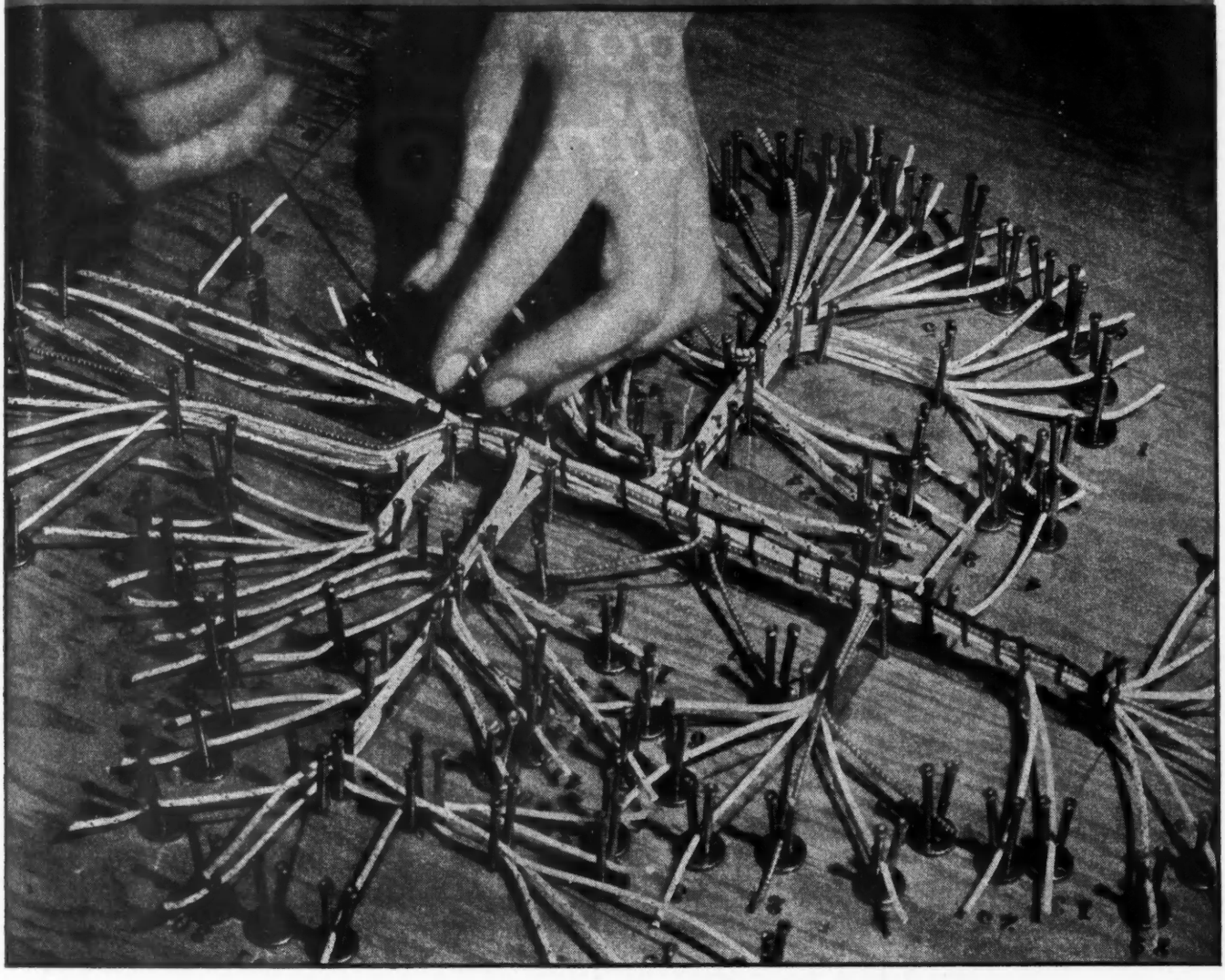
Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
101 JEFFERSON ST., THREE RIVERS, MICHIGAN

. . . TRAINED HANDS assure PERFECT WORK



Let WHITAKER produce your wiring assemblies!

A lower cost of manufacturing is one of many important advantages Whitaker offers you on Cables, Wiring Harnesses and Assemblies you may require to produce finished products . . . We are wiring *specialists,* and the trained hands of our skilled workers assure perfect work.

You can avoid grief, and save time and money through our specialized service. You have everything to gain by utilizing the full benefits of our 25 years of experience, our ample engineering and production facilities, trained manpower, exacting inspections, and the economies resulting from our use of modern methods, and special equipment.

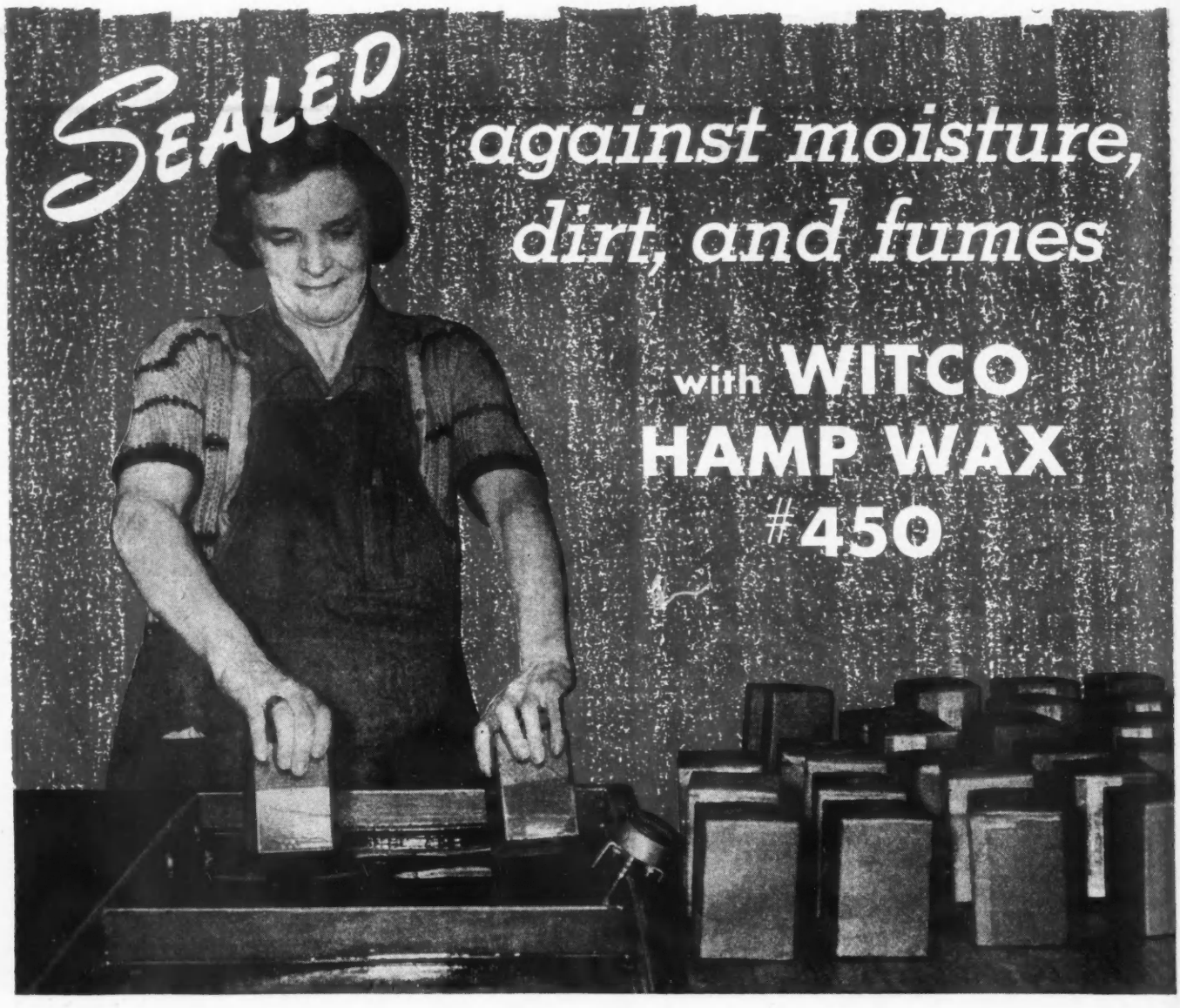
Whitaker Can Wire It

In addition to an engineered wiring service, Whitaker also offers a quality line of standard cable products.

We cordially invite you to write us.

WHITAKER CABLE CORPORATION

General Offices: 1305 Burlington Avenue, Kansas City 16, Missouri
Factories: Kansas City, Mo. • St. Joseph, Mo. • Philadelphia • Oakland

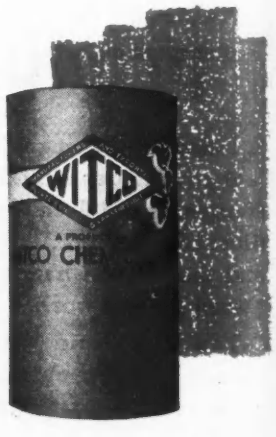


Formulated to conform to U. S. ARMY ORDNANCE SPECIFICATION AXS-1015, Rev. 1

★ A light-colored, homogenous dipping wax that is non-corrosive to steel, aluminum, or copper. It is transparent, so that the package labels and part numbers can easily be read through the coating.

Witco Hamp Wax #450 sets in less than two minutes after dipping, to form a continuous, non-hygroscopic coating that will not soften at temperatures below 145 F nor flake at −10 F or above. It gives ideal protection to packages for overseas shipment.

Ask for details of this and other Witco Protective Materials described in new bulletin just off the press. A copy will be sent gladly.



Packed in 90 lb fibre cartons

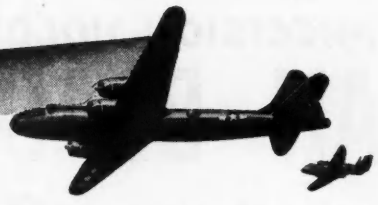
OTHER WITCO PROTECTIVE MATERIALS ★ **Witco Mastic #224 Box Coating** ★ **Witco Mastic #250 Bag Sealer** ★ **Witco Rust Inhibitor #673**

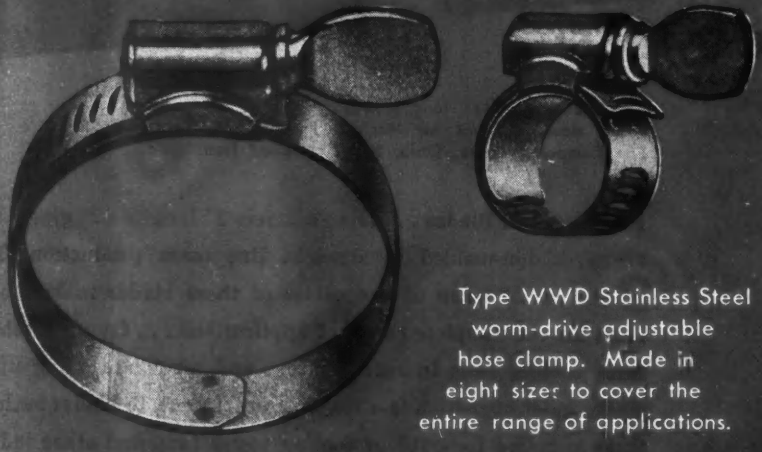
WITCO CHEMICAL COMPANY

435 N. MICHIGAN AVE., CHICAGO 11, ILL. ★ EST. 1920 ★ 7338 WOODWARD AVE., DETROIT 2, MICH.

For Utmost Dependability...

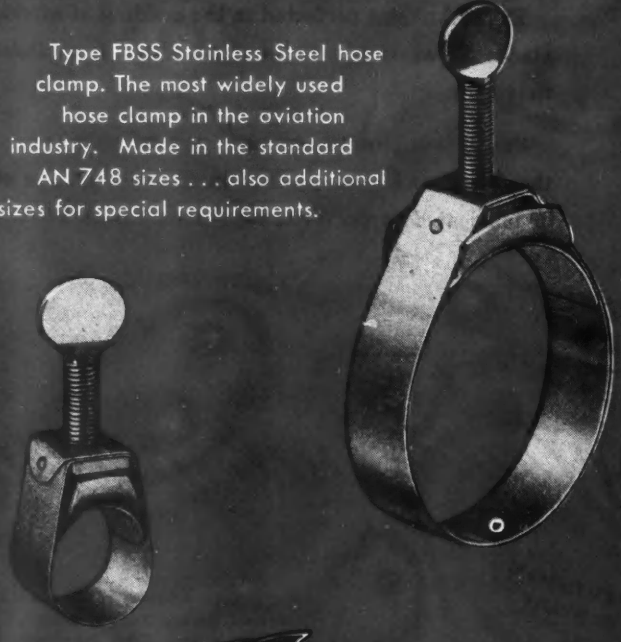
WITTEK *Aviation* HOSE CLAMPS





Type WWD Stainless Steel worm-drive adjustable hose clamp. Made in eight sizes to cover the entire range of applications.

Type FBSS Stainless Steel hose clamp. The most widely used hose clamp in the aviation industry. Made in the standard AN 748 sizes . . . also additional sizes for special requirements.



Dependability has been recognized by the Wittek Manufacturing Company during its 25 years of hose clamp manufacturing experience as a foremost requirement in any hose clamp design. Wittek assures this dependability by the selection of basically sound designs . . . the use of high-grade materials and the application of good workmanship. Today Wittek offers two distinctly different hose clamp designs—each of which meets the requirements of Specification AN-FF-C-406 A.

TYPE WWD—an adjustable worm drive hose clamp made of stainless steel and designed to take full advantage of the superior physical properties of that material. Note the compact streamlined housing . . . the hardened one-piece thumbscrew—PLUS a new exclusive Wittek feature—an inner band of Stainless Steel accomplishing the two-fold purpose; (1) protecting the hose from the serrations in the outer band, and (2) distributing the load uniformally to provide greater strength and superior sealing characteristics.

TYPE FBSS—an improved Stainless Steel version of Wittek's basic FB design—now incorporating a bridge extender—in all sizes. This is the most effective hose clamp for all applications where an adjustable clamp is not necessary.

Hose Clamps for all requirements, made by Wittek—specialists in hose clamps and their applications.

ARMY E NAVY

War Bonds for Victory . . Buy More Than Ever Before!

WITTEK
MANUFACTURING CO.
4305-15 W. 24th Place, Chicago 23, Ill.

Aviation HOSE CLAMPS

PANELYTE*

PRECISION-MOLDED
FAN BLADES

GIVE YOU THESE 9 *ADVANTAGES:*

Panelyte Blade (62" long — 14½" wide) mass-produced for Hartzell Propeller Fan Company, Piqua, Ohio, being removed from mold.

1. QUIET OPERATION
2. LIGHT WEIGHT
3. RESISTANCE TO CORROSION
4. LOW MOISTURE ABSORPTION
5. GREAT STRENGTH
6. STABILITY UNDER TEMPERATURE CHANGES
7. LOWER STARTING CURRENT URGE
8. REDUCED BEARING LOADS
9. TROUBLE-FREE PERFORMANCE

Panelyte Fan Blades . . . from midgets 2" long to 62" giants . . . are precision-molded in straight line mass production. The unique combination of properties of these blades makes them ideal for the complete range of applications . . . from household fans, cooling fans in refrigerators and air-conditioning units where quiet operation is a major requirement, to blades such as those supplied for outdoor cooling tower fans and other industrial and domestic uses where resistance to corrosion and extremes of temperature are paramount.

The techniques perfected in the molding of aircraft propeller blades in wartime will produce better *fan blades* for peace time uses.

Panelyte engineers are ready to work with you . . . to discuss the design and mass production of fan blades or other molded or fabricated parts. Write for factual "Data Book."

PANELYTE *the structural plastic*

PANELYTE DIVISION
ST. REGIS PAPER COMPANY
230 PARK AVENUE
NEW YORK 17, N. Y.

Sales Offices: Atlanta, Boston, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Kansas City, Los Angeles, Mexico City, Montreal, New Orleans, Phoenix, Portland, St. Louis, St. Paul, San Francisco, Seattle, Syracuse, Toronto, Trenton, Vancouver.

★ MASS PRODUCTION OF SHEETS, RODS, TUBES, MOLDED FORMS, FABRICATED PARTS IN PAPER, FABRIC, FIBRE GLASS, WOOD VENEER AND ASBESTOS BASE LAMINATES

ALLOY TIPPED TOOLS

FOR HIGHER SPEEDS

• Where cutting speeds must be increased to keep pace with modern methods, Scully-Jones and Company standard tungsten carbide and Haynes Stellite tipped tools effect substantial savings by increasing production, giving better finish, longer tool life with less regrinding, and lower cost per unit produced.

Years of experience and engineering knowledge assure correct grades of alloys for your particular job. Our facilities provide prompt and dependable service.

Kindly send drawings or specifications for quotations on special tools.

Scully-Jones AND COMPANY

1901 SOUTH ROCKWELL STREET ★ CHICAGO, U. S. A.

LAST TIME FOR A LONG TIME!

Because This Time He's Replacing With Long-Life Service "ForgeWelds"

● To save time spent replacing casters that just can't stand constant pounding, replace with Service Heavy-Duty "ForgeWelds." You'll replace fewer in the long run. These casters are really tough—built to carry your heaviest loads with no attention except occasional greasing. As an extra dividend, you'll find trucks, trailers and other hauling units moving with new liveliness and speed.

- **UNBREAKABLE**— As shown, top plate and king bolt are a single piece, drop forged from SAE-1045 steel.
- **INSTANT SWIVEL**— Double circle of balls in machined raceways of 230 Brinnell hardness.
- **EASY ROLLING**— Hyatt Roller Bearings in wheels.
- **LUBRICATION**: High pressure type.
- **CAPACITY**: 6,000 to 8,000 lbs. per set of 4.
- **WHEELS**: Your choice of Ni-Steel-Iron or floor-protecting molded plastic.

SERVICE CASTER & TRUCK DIVISION of Domestic Industries, Inc.

676 N. Brownswood Avenue, Albion, Michigan
Eastern Factory: 449 Somerville Ave., Somerville (Boston) Mass.
Toronto, Canada: United Steel Corporation, Ltd., SC&T Co. Division

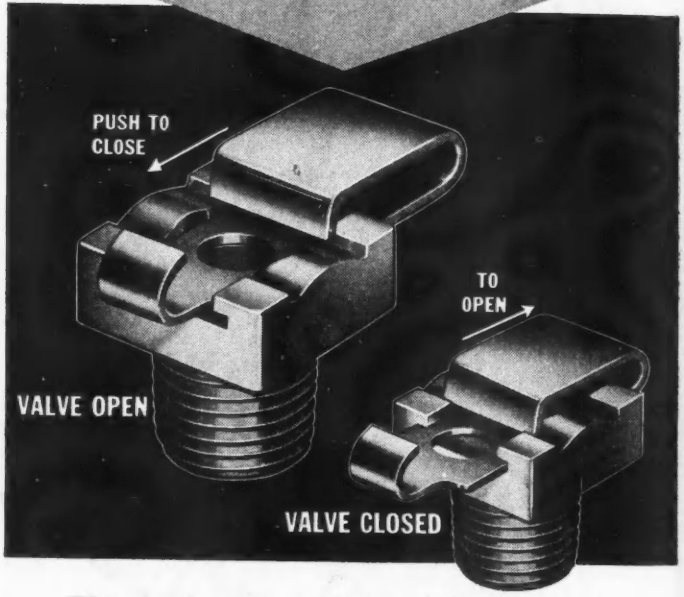
SERVICE

POWER LIFT TRUCKS • MANUAL LIFT TRUCKS • LIFTERS • CRANES TRUCKS & TRAILERS • DOLLIES SKIDS • CASTERS • WHEELS

CAN YOU USE A NEW DRAIN COCK

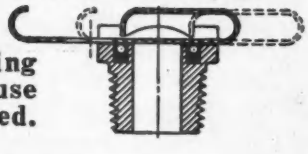
. . . that will operate under pressures up to 200 lbs. per sq. in.?

. . . that can be used with all types of liquids?



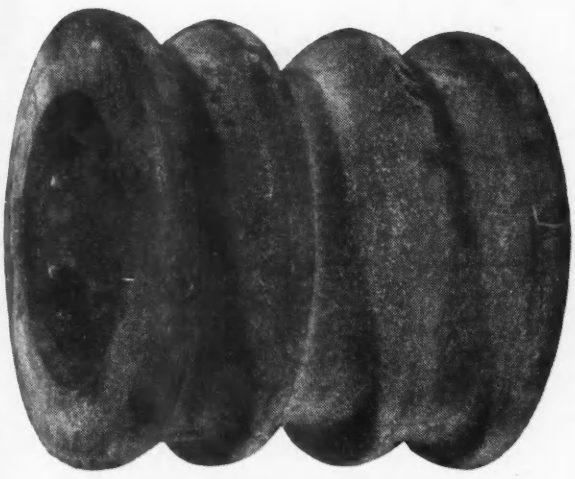
The construction of this new drain cock is so simple that the possibility of functional failure is reduced to a minimum.

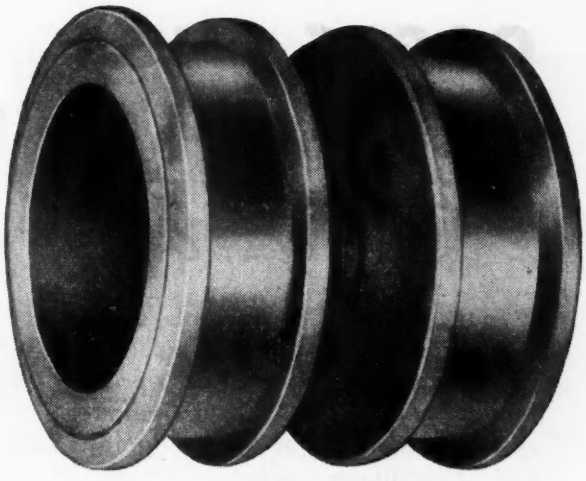
It has but four working parts and is sealed with a standard "O" type ring that can be easily replaced. Lightweight, yet rugged in construction, it is vibration proof and positively will not leak. Its simplicity of design and minimum of working parts make this drain cock a must in all postwar water, oil and gas systems. For full information write the Engineering Dept., and indicate use or application desired.



Whittaker

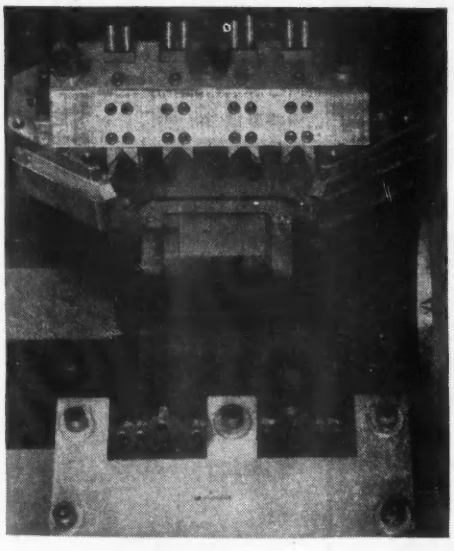
WM. R. WHITTAKER CO., LTD., 927 NORTH CITRUS AVENUE LOS ANGELES 38, CALIFORNIA





FROM THIS . . . . . TO THIS

IN 4 MINUTES (Floor to Floor Time)

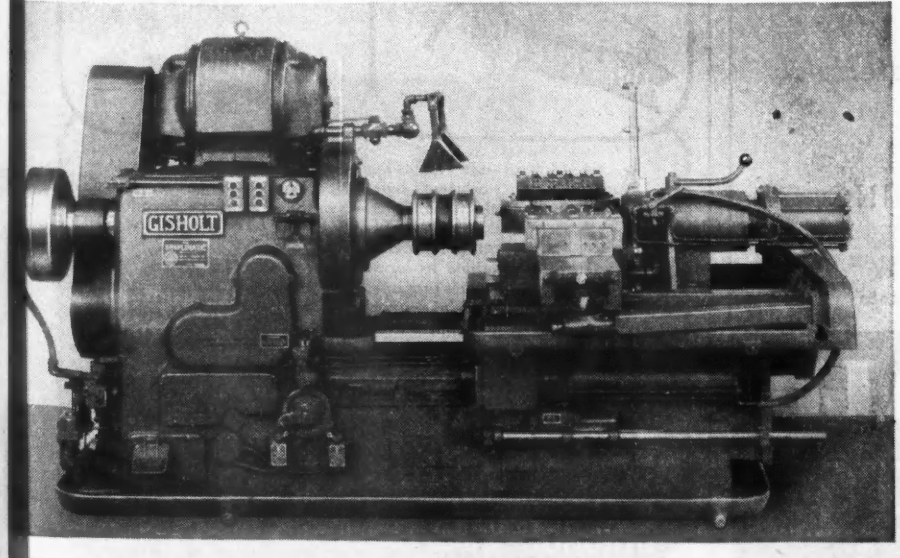


Here's another good example of the way a large number of surfaces can be machined at one time. Gisholt's versatile design permits many variations with two or more heavy duty slides, each with its own drive, its own rate and direction of feed. Yet, all are driven from and accurately timed with the spindle.

These track rollers are machined with 24 carbide tipped tools on 3 slides. Actual cutting time is 2½ minutes using over 40 H.P. Loading, unloading, etc., require 1½ minutes. Total time, floor to floor: 4 minutes.

THE GISHOLT SIMPLIMATIC

The machine shown here is equipped with an expanding arbor operated by a 16″ air cylinder; has a tailstock and three tool slides. It is tooled to machine two sizes of two different types of track rollers. All machine functions are automatic, operated by a single control. An operator can normally tend several Simplimatics. If large volume, low cost machining interests you, write for information about Gisholt Automatic Lathes.



GISHOLT MACHINE COMPANY
1205 East Washington Avenue
MADISON 3, WISCONSIN

Look Ahead... Keep Ahead... With Gisholt Improvements in Metal Turning

GISHOLT

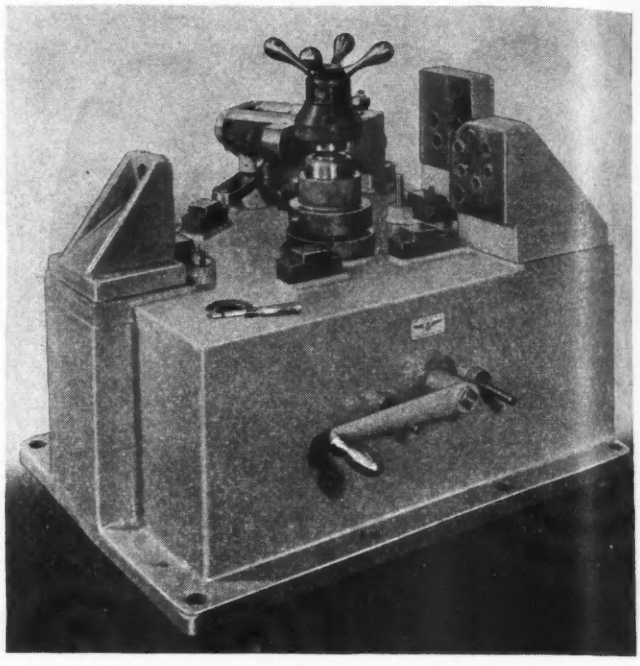
TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

GAGES • JIGS and FIXTURES

Designed and Produced to Your Order

● In the design of special tools, gages, jigs and fixtures for expediting and controlling production, MERZ engineers approach each problem from *two* directions: *first*—from the standpoint of guaranteed accuracy, *second*—from the standpoint of simplicity, and facility of operation.

When you commission MERZ to design and build your special fixtures and gages you are assured of equipment for maximum quality and quantity of production. Write for literature describing our skill and facilities in this highly specialized field of engineering service. Prompt shipment of MERZ standard A.G.D. gages, from stock.



We are specialists in the design and production of experimental machines and devices

MERZ Engineering Company

INDIANAPOLIS 7, INDIANA

FITZGERALD

GASKETS
GREASE RETAINERS
OIL SEALS
GASKET PACKING MATERIALS

•

Gasket Craftsmen
for 39 Years

Gaskets of all types and materials

•

The
FITZGERALD MANUFACTURING CO.
TORRINGTON, CONN.

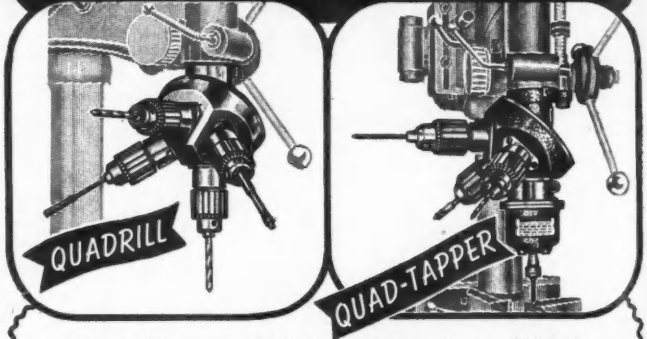
Branches at Chicago and Los Angeles
Canadian FITZGERALD Limited, Toronto

FITZGERALD GASKETS

SINCE 1906

THE COMPLETE LINE THAT COMPLETELY SATISFIES

Here's how you can DRILL and TAP 4 TIMES FASTER..



★ Your drill presses should be equipped with the QUADRILL 4-position turret attachment. It actually converts a single drill press into FOUR. More than that, it permits hi-speed tapping operations when the self-reversing QUAD-TAPPER (designed only for use with the Quadrill), is attached. The Quadrill and Quad-Tapper combine to form one of the greatest production tools presented to industry in years. In fact... the "blue book" of industry is already heavily represented among our many users.

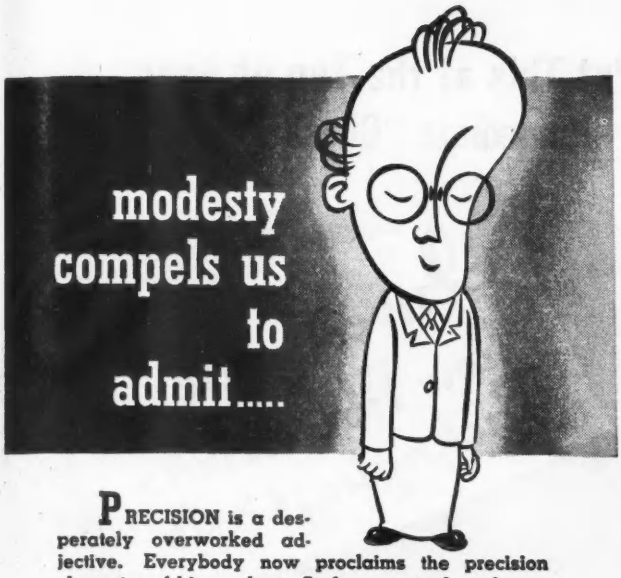
Speed operations—eliminate costly lost motion moving from press to press. Save hours of time with this new, low-priced, precision-built unit... the QUADRILL.

Guaranteed Satisfaction or Money Back

AT LEADING JOBBERS EVERYWHERE

ACT AT ONCE—IMMEDIATE DELIVERIES—WRITE TODAY!

CHICAGO Drillet Corporation 919 S. Michigan Ave. Chicago 5, Illinois



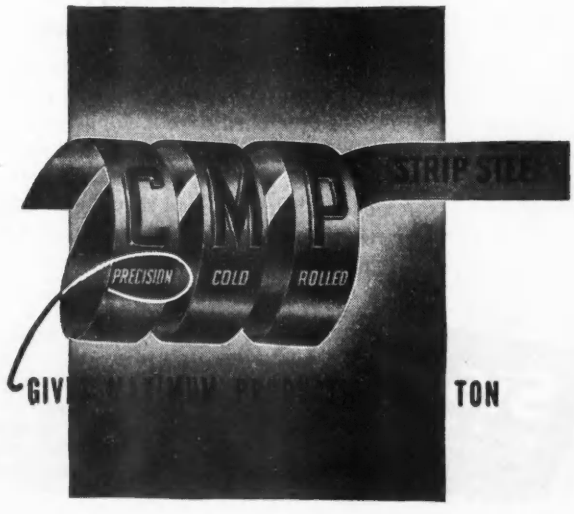
PRECISION is a desperately overworked adjective. Everybody now proclaims the precision character of his product. And many steel producers have joined the jubilee. But while precision is a quality exalted in the advertising, it sometimes fails to show in the finished steel item.

CMP designed and put into operation the first rolling mill equipment capable of consistent production of great quantities of flat-rolled metals to degrees of accuracy then unknown. CMP, therefore, can be forgiven its application of the term PRECISION to its Cold Rolled Strip Steel. The CMP product still leads all others in this characteristic. Users of strip steel know that the accuracy-to-gauge and uniformity of physicals, finish and shape recited in CMP advertising are to be found regularly in CMP PRECISION Strip Steel.

Better your products and profits through use of CMP'S cooperative service for metal fabricators. Write a description of the metal you need, or tell us of your fabrication plans and problems. We'll send our recommendations to you promptly.

THINSTEEL FACTS
Coils up to 300 lbs. per inch of width Carbon and alloy grades • Wide range of physicals • Extremely close tolerances • Widths up to 24 inches

THE COLD METAL PRODUCTS CO.
SUBSIDIARY OF THE COLD METAL PROCESS CO.
YOUNGSTOWN, OHIO



For the RIGHT Brush Prescription Call in a SPECIALIST

SPEER

You can depend on SPEER Carbon Brushes to perk up D. C. and slip-ring motors and generators because every SPEER Brush is matched—mechanically and electrically—to the service characteristics of the machine it's sold to serve.

In the Matched Dependability of SPEER brushes you get utmost freedom from burning, overheating, sparking, excessive wear and energy losses, and other brush troubles that decrease operating efficiency, cause extra maintenance.

You save time and avoid the possibility of brush "misfits," when you take advantage of SPEER'S nearly 50 years' specialization in fitting brushes to machines. From its all-inclusive line of standard and special carbon, graphite, electro-graphite and metal-graphite brushes, SPEER can supply the grade that will deliver peak performance, fewer brush renewals and less maintenance on any application.

For SPEER brushes matched to *your* motors, see your supply house —or electrical contractor — or write direct for Brush Data Forms.

SPEER
CARBON COMPANY
ST. MARY'S, PA.

CHICAGO • CLEVELAND • DETROIT
MILWAUKEE • NEW YORK • PITTSBURGH

7384

GENERAL CONTROLS'

new, revolutionary

ELECTRIC MOTOR VALVE

AV-16

— hits a new high in hi-g progress

Most compact. Featherweight. Insures absolutely tight shut-off. Less current consumption. High flow capacity with minimum pressure drop. 100% safe, with explosion-proof housing. AN fluid and electrical connections. Authorized users will be furnished with complete engineering data.

hi-g

GENERAL CONTROLS

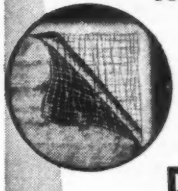
801 ALLEN AVENUE, GLENDALE 1, CALIF.

FACTORY BRANCHES: Philadelphia, Atlanta, Boston, Chicago, Dallas, Kansas City, New York, Denver, Detroit, Cleveland, Pittsburgh, Houston, Seattle, San Francisco. Distributors in Principal Cities.

Put This at the Top of Your Immediate "Check List"

Investigate... how Fibreen cuts Packaging Costs

Time Tested... Field Tested



FIBREEN

Does a *Better* Packaging Job

Sisal fibre reenforcement for strength — special asphalt for water-proofness —kraft paper to make it scuff-proof—sealed by heat and pressure to produce Fibreen.

Hundreds of manufacturers in practically every industry are saving time, material, freight or handling costs by using Fibreen. They have simplified their shipping room procedure . . . given their products better protection against moisture and dirt damage . . . cut damage claims by assuring shipments arriving at destination in good condition. In many cases, products wrapped in Fibreen go forward on open cars . . . in others, crates replace boxes. Shipping is more compact... weight is eliminated... more units can be gotten into minimum cars.

Many Uses for Tough, Moisture-Proof Fibreen

Fibreen is now busy with war packaging. Nevertheless, investigate the full possibilities as applied to your shipping problems . . . as lining for crates and cases, for bags . . . to wrap small, large, heavy, or light bales, and odd shaped packages, etc. . . . for LCL, express, or carload shipments.

THE SISALKRAFT CO.
205 W. WACKER DRIVE · CHICAGO 6, ILL.
NEW YORK · SAN FRANCISCO · LONDON · SYDNEY
In Canada Write to Alexander Murray & Co., Limited, at Montreal · Toronto · Halifax · Saint John · Winnipeg · Vancouver

Manufacturers of SISALKRAFT, FIBREEN, SISAL-X, SISALTAPE AND COPPER-ARMORED SISALKRAFT

On Time Delivery of Small Parts

WADSWORTH FACILITIES

Die Making
Jigs and Fixtures
Gage Making
Model Building
Milling
Drilling
Turning
Stamping
Screw Machining
Hard Soldering
Heat Treating
Line Assembly
Polishing
Lacquering
Photo Etching
Product Decorating
Silk Screening
Metals Laboratory
Engineering Design
Product Design

WADSWORTH specializes in production of critical small parts and sub-assemblies, difficult or expensive for the average plant because of intricacy or close tolerance. These we are prepared to make in any quantity and to deliver on time. Let us discuss with you your future requirements.

SMALL PARTS DIVISION

THE Wadsworth WATCH CASE CO., INC.

DAYTON, KENTUCKY, SUBURB OF CINCINNATI, OHIO

TODAY WE ARE SERVING THESE INTERESTS: Aircraft • Automotive • Bearing • Electronics Instruments • Machine Tool • Small Arms • Refrigeration

WHERE THE ARMS OF WAR ORIGINATE

MACHINE TOOLS form the basis for a war production program. An untold number of precision drilling operations must be performed to produce superior fighting equipment. And in the tooling for this war Sibley Drilling Machines have played an important part.

SIBLEY

MACHINE & FOUNDRY CORPORATION

SOUTH BEND 23, INDIANA

★ *Executives!* ★

SHOW YOUR APPRECIATION TO OUR EX-GIs . . .

WIN GOODWILL OF 13,000,000

Display This Handsome

Bas-Relief

PLAQUE

★ This attractive 3-dimensional plaque is your amazingly simple way to demonstrate your friendliness to those who have served . . . your opportunity to make them proud to be back . . . proud of your reception of them.

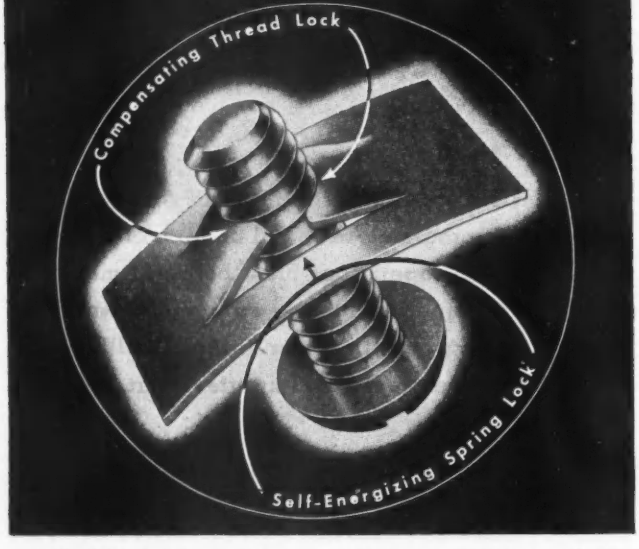
Put this distinctive, goodwill-building tribute where everyone can see it. Beautifully made of ⅛" durable Masonite presdwood, 24 by 24 inches, deep rich brown. Discharge emblem design in 4 gold tones thru halftone, on Masonite presdwood, edges finished and mounted 1 inch in front of background panel. Lettered strips in gold color. Be FIRST in your locality to welcome returning Servicemen and women. Single units **$8.75**—3 or more, only **$8** each!

***SEND NO MONEY**—just order on your letterhead with your name and title TODAY!*

W. L. STENSGAARD AND ASSOCIATES, INC.

346 N. JUSTINE STREET • CHICAGO 7, ILL.

NOTHING LOCKS LIKE A SPEED NUT



SPEED NUTS are the only fastening devices that provide a COMPENSATING thread lock and a SELF-ENERGIZING spring lock. TWO distinct forces are exerted on the screw, as the SPEED NUT is tightened.

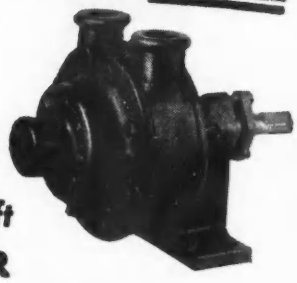
First, a compensating thread lock, the two arched prongs moving inward to engage and lock against the root of the screw thread. These free-acting prongs compensate for tolerance variations, and function perfectly on oversize or undersize screw or bolt threads.

Second, a self-energizing spring lock, created by the compression of the arch in both the prongs and base. The combined forces of thread lock and spring lock definitely eliminate vibration loosening. Literature is available on over 3000 shapes and sizes, for standard or special assemblies.

TINNERMAN PRODUCTS INC.
2059 Fulton Road, Cleveland, Ohio

Speed Nuts
FASTEST THING IN FASTENINGS

WHEN YOU NEED PRECISION-BUILT SMALL PUMPS . . . *Specify* TUTHILL



If the Pump Drives from a Reversing Shaft

. . . IT'S MODEL R

For lubrication, coolant or liquid transfer service on reversing machinery, Tuthill Automatic Reversing Pumps offer the practical solution. Without the use of check valves and without changing the direction of flow of the pumpage, these internal-gear rotary pumps solve the problem of driving the pump from a reversing shaft and provide the answer where the ultimate direction of shaft rotation is not known. Capacities from 1 to 50 g.p.m. and pressures up to 100 p.s.i. Available with or without internal-relieving feature; also in stripped model form. Write for Tuthill Automatic Reversing Pump bulletin.

Tuthill Pumps are serving Army Navy • Air Force • Merchant Marine and Industry

TUTHILL PUMP COMPANY
939 EAST 95TH STREET • CHICAGO 19, ILLINOIS

WHITNEY-JENSEN PRODUCTS
30 YEARS EXPERIENCE

AIRCRAFT RIVET SQUEEZERS

Standard, Alligator, Crab, Snake Head, and Pelican types for speedy, accurate, uniform setting of aluminum rivets up to 5/32" size. Pelican type (shown) in 6 sizes from 1¾" to 6" throat depth.

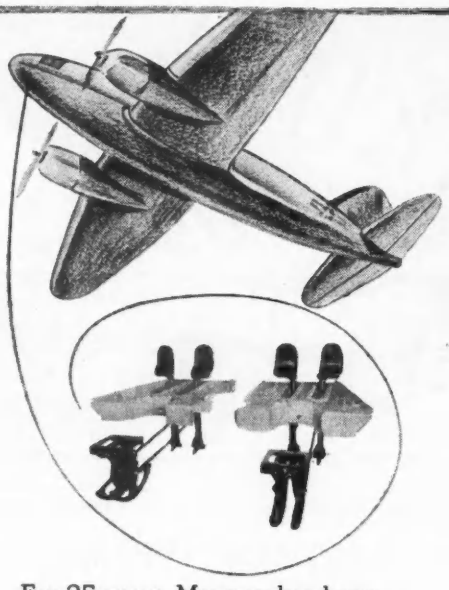
NEW DEEP-THROAT LEVER PUNCHES

Made in 7", 10", 18", 24" throat depths. Powerful geared action. Capacity, 7½ tons. Throat height 6", die space 3¼". Standard equipment includes depth and side gauges, punch holder, die adaptors, die shoe and one punch and die.

NO. 5 JR. PUNCH

Capacity ¼" hole in 16 ga. iron. In metal kit box with 7 punches and dies. A handy and very popular tool.

WHITNEY METAL TOOL COMPANY
190 FORBES ST. • ROCKFORD, ILL.



For 25 years, Mercury has been building aircraft, aircraft parts and aircraft accessories . . . gaining the experience and "know how" which assures quality products and prompt deliveries.

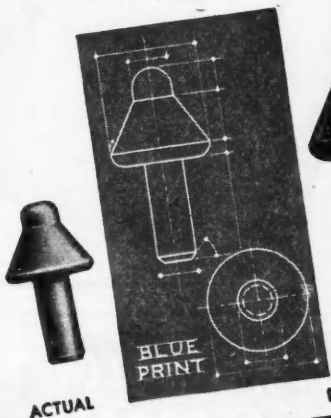
MERCURY AIRCRAFT

FUEL TANKS
AIRCRAFT SURFACES
PARTS ACCESSORIES

HAMMONDSPORT NEW YORK

ANOTHER SPECIAL BY PROGRESSIVE

QUALITY PROMCO BRAND



ACTUAL SIZE

ENLARGED FOR DETAIL

CATALOG SHOWS DOZENS MORE

Special heads, threads and finishes on any metal or alloy adapted to cold upset. Weekly output: 25,000,000 pieces. Many specials, suggesting production savings for you, illustrated in latest catalog. Includes weights per 1M standard pieces, decimal equivs. of fractions, other purchasing and engineering helps. Write for Catalog 18.

The PROGRESSIVE MFG. CO.
38 NORWOOD ST., TORRINGTON, CONN.

★ BUY MORE WAR BONDS BUY MORE WAR BONDS ★

New SAW-GUN

PORTABLE POWER SAW AND FILE

$42.00 QUICK SHIPMENT ON AA-5 PRIORITY OR HIGHER

- CUTS ALL METALS—WOOD—PLASTICS
- SAWS AND FILES IN INACCESSIBLE PLACES
- OPERATES BY ELECTRICITY—FLEXIBLE SHAFT—AIR
- SIMPLE AND EASY TO USE—LIBERALLY GUARANTEED

SEE YOUR JOBBER OR WRITE DIRECT

Mid-States EQUIPMENT CO.
Saw-Gun Division

2430 SOUTH MICHIGAN AVENUE, CHICAGO 16, ILLINOIS

Only a Car Away
-Shank's Pony

WITHOUT a car, a man's afoot; and walking means wasting — wasting time that could and should be used in war effort.

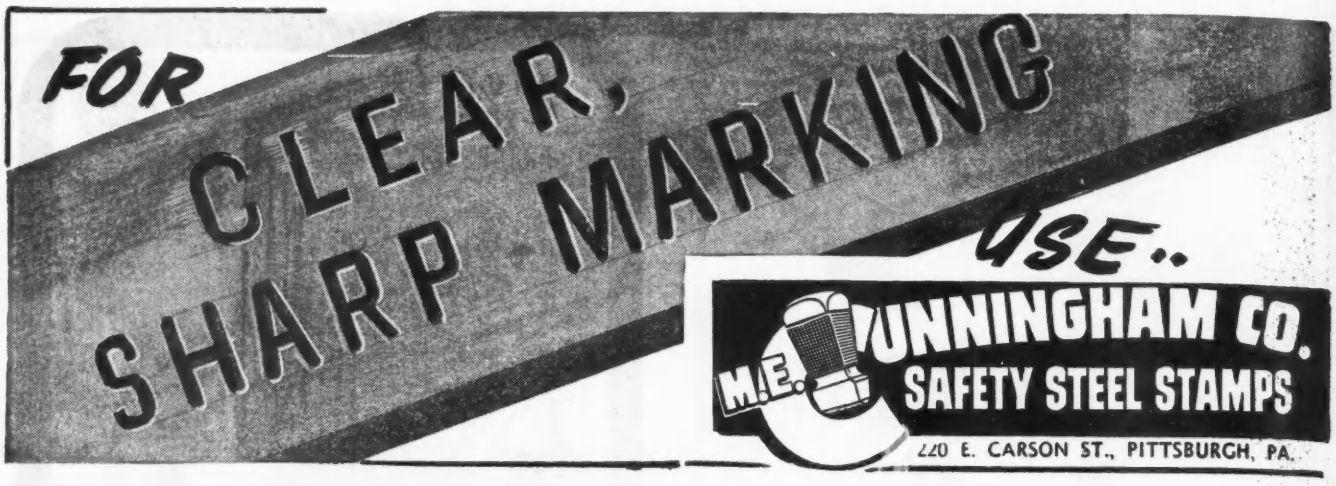
A man's car represents his forty years advancement in transportation over the pre-car age. Without it, he steps back into the slow-motion era.

"Rings made by Simplex", besides satisfactorily filling military requirements on land, sea and in the air, have also adequately met demands of distributors and service shops. They have done much towards preventing a break-down of America's vital home-front transportation system of both cars and trucks.

BUY WAR BONDS AND KEEP THEM

SIMPLEX PISTON RINGS

SIMPLEX PRODUCTS CORP., Cleveland, O.



The Trimount Series "N" All-Purpose Differential Type Dynamic Pressure Gauge has applications in almost every industrial field, and is particularly valuable for proving ground and road tests of automobiles and other motor driven vehicles.

Induction system pressures, fuel system pressures, hydraulic system pressures, and torque, strain, vibration and shock load measurements can be made quickly and simply.

For detailed information, simply drop us a card.

Electronics Division

TRIMOUNT
INSTRUMENT COMPANY

37 W. VAN BUREN ST. CHICAGO 5, ILL.

P&J
.. for over 40 years
THE PIONEER MANUFACTURER OF
AUTOMATIC CHUCKING EQUIPMENT
POTTER & JOHNSTON · MACHINE CO.
PAWTUCKET, RHODE ISLAND

AUTOMOTIVE *and* AVIATION INDUSTRIES

Penetrates into Leading Plants in the Automotive and Aircraft Industries

JOSEPH S. FRANCIS

Engineers • ***Designers***

Design and Development of Products,
Production Machinery
Automotive and Allied Equipment

343 S. Dearborn Street, Chicago 4

Telephone — Har. 7991

Classified Advertisements

AUTOMOBILE MARKET—BRAZIL. Brazilians, having been connected with the most important American automobile companies in Brazil in the last 20 years in sales services and technical activities all over the Brazilian territory, offer their services as employees or representatives to firms willing to start or develop business in Brazil. For further information please write to "Brazilians," P. O. Box (Caixa Postal) No. 2194, São Paulo, Brazil.

MALE HELP

Senior and junior tool designers, senior and junior product engineers, plant layout men, electrical and mechanical engineers, draftsmen and detailers wanted by an aggressive Michigan automotive and Diesel parts manufacturer with a bright post war future. Openings for experienced men and recent engineering college graduates. In reply state age, education, experience, draft status and salary. Must comply with W.M.C. regulations. Address Box 39, care Automotive and Aviation Industries, Chestnut & 56th Streets, Philadelphia 39, Pa.

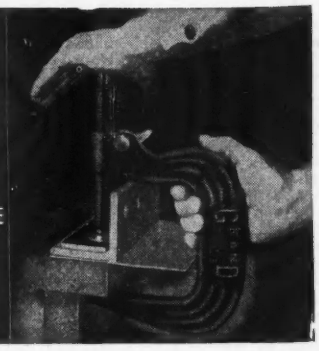
FOR SALE

Portable Power Bag & Box Piler & Conveyor. Ideal for truck loading and material handling operations. Pays for itself in 60 days. Industrial and truck scales. Immediate delivery. Bonded Scale Co., 102 Kingston, Columbus 7, Ohio.

UNIVERSAL MIDGET TOOLS: DANDY SIXTEEN PIECE SET: Midget Pliers, Diagonal Cutters, Four Midget End Wrenches, Needle-nose Pliers, Screwholder, Six Punches and Chisel, Round File, Midget Crescent Wrench. $14.85. IMMEDIATE SHIPMENT—Overnight by Air to Anywhere USA. Remit today. Price List and Order Blank Free. Write Now for Dealers Quantity Discounts. UNIVERSAL TOOL COMPANY, 1527 Grand AAI, KANSAS CITY, MO. Remember: We have it, can get it, or it isn't made.

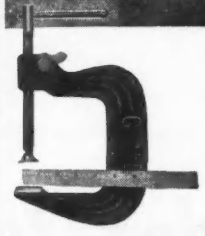
NEW! Another GRAND Speed CLAMP

- EXTRA DEEP THROAT
- QUICK SETTING
- INSTANT TRIGGER RELEASE
- SPATTER-PROOFED



HERE IS THE EXTRA-DEEP THROATED SPEED CLAMP YOU HAVE BEEN ASKING FOR

GRAND A. S. L. DEEP THROAT CLAMPS



Position instantly with push on combination ratchet screw (no waste motion running down screw) and tighten with turn of vise-type handle —Holds work with firm tension grip on any surface, even slanting or irregular; ball and socket swivel (replaceable) prevents shifting or creeping.

Release instantly—simply loosen handle and push on trigger—clamp lifts free, ready for application to other work.

Made of Alloy-Steel of Forged Clamp Capacity.

SPATTER-PROOFED—All working parts are COPPER PLATED against welding spatter.

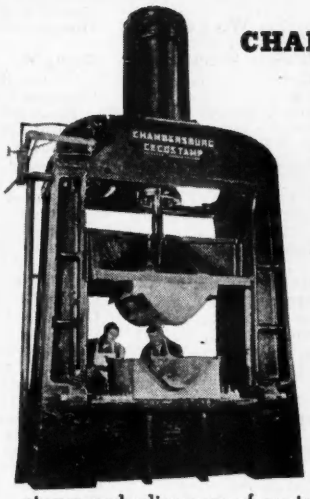
Write for Catalog on Complete Line of GRAND Speed Clamps for every kind of work

EXTRA DEEP THROATS

	Opening	Throat
No. 4-ASL	4¾"	4¼"
No. 6-ASL	6¾"	4¾"
No. 8-ASL	8¾"	6"

PROMPT SHIPMENT

GRAND SPECIALTIES COMPANY
3113 Grand Avenue CHICAGO 22, ILL.



CHAMBERSBURG CECOSTAMP

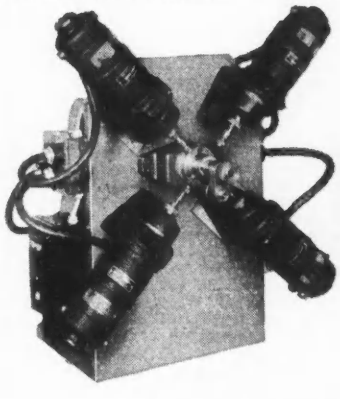
A high production, impact-type stamping machine for drop-stamping light-weight, high strength, sheet metal parts of high ductility. The Cecostamp overcomes the resiliency of hard to-form metals, such as stainless steel and aluminum alloys, and gives them a permanent set at a higher rate of production. The Cecostamp embodies ease of control, flexible performance and rapidity of output with economy. It is in use in most of the aircraft manufacturing plants in the United States, Great Britain and U. S. S. R.

Details in Bulletin No. 276

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

CHAMBERSBURG

HAMMERS • PRESSES • CECOSTAMPS



DRILLING AT 10,000 R.P.M.

4 Holes at One Time!

MULTIPLE drilling of holes from 1/32" up, at a speed as high as 10,000 R.P.M., is no longer an impossibility. It is now being done on many mass production jobs by means of the Govro-Nelson Automatic Drilling Unit, with a set-up such as illustrated above, drilling 4 holes at a time in a brass fuse part.

This exceptionally high rate of speed is made possible by the Unit's centrifugal-feed feature, which automatically safeguards the tool against breakage.

Other models available for different speeds and conditions. Designed for drilling up to ¾", depending upon the material.

WRITE FOR Literature

GOVRO-NELSON CO.
1931 Antoinette
DETROIT 8, MICH.

Automatic DRILLING UNIT

MANHATTAN RUBBER

MOLDED AIRCRAFT PARTS

isolate vibration, seal joints, protect men and equipment

To isolate vibration, seal joints and protect men and equipment on aircraft, MANHATTAN developed specially engineered molded rubber parts from natural and synthetic rubbers.

Motor Mounts, Diaphragms, Sealing Rings, Packings, Gaskets, Grommets, Ignition Parts, Bumpers, Brake Cylinder Cups and Boots, Cylinder Air Deflectors, Non-Slip Matting are some of the MANHATTAN Rubber Products on aircraft.

Other MANHATTAN Rubber Products speed fabrication. They include:

Air Hose	Conveyor Belt
Paint Spray Hose	Other rubber
Welding Hose	products for
Abrasive Wheels	plant maintenance
Transmission Belt	Plane Fueling Hose

Keep ahead with MANHATTAN

THE MANHATTAN RUBBER MFG. DIVISION
OF RAYBESTOS-MANHATTAN, INC.
Executive Offices Passaic, New Jersey

A-C Spark Plug Div. ..... —
Acadia Div. Western Felt Works.. 154
A-C Spark Plug Div..... 199
Acadia Div. Western Felt Works. 138
Accurate Spring Mfg. Co..... 50
Acheson Colloids Corp..... 127
Acme Aluminum Alloys, Inc..... —
Adel Precision Products Corp..... 75
Aeronautical Products, Inc..... 159
Aetna Ball & Roller Bearing Co... —
Air-Maze Corp. ..... —
Air Reduction Sales Co..... —
Aircraft & Diesel Equip. Corp..... 98
Aircraft Mechanics, Inc..... —
Aircraft Screw Products Co., Inc. —
Ajax Mfg. Co..... 130
Allegheny Ludlum Steel Corp..... —
Allied Cement & Chemical Corp... —
Allied Products Corp..... —
Aluminum Co. of America..... 151
Aluminum Industries, Inc..... —
Aluminum Research Institute..... —
Alvey-Ferguson Co., The..... 96
American Air Filter Co., Inc..... 58
American Bosch Corp..... —
American Brakeblok Div. of American Brake Shoe Co..... —
American Broach & Machine Co.. —
American Chain & Cable Co., Inc. 154
American Chemical Paint Co..... 156
American Coil Spring Co..... —
American Felt Co..... 110
American Hammered Piston Ring Div. Koppers Co..... 95
American Metal Products Company 140
American Metal Works, Inc. 118
American Phenolic Corp..... 103
American Screw Co..... —
American Steel & Wire Co..... —
American Tube Bending Co., Inc.. —
Anchor Post Fence Co..... —
Andover Motors Corporation..... —
Ansul Chemical Co. (Dugas Div.) —
Arkansas Fuel Oil Company..... 131
Armour Research Foundation.... —
Armstrong Cork Co..... 4
Aro Equipment Corp..... —
Arrow Safety Device Co..... —
Associated Spring Corp..... —
Atlas Drop Forge Co..... 106
Auto Specialties Mfg. Co..... —
Automatic Transportation Co..... —
Automotive & Aircraft Div. Amer. Chain & Cable Co., Inc..... —
Aviometer Corporation ..... —

B-H Aircraft Co., Inc..... 112
B-W Superchargers, Inc..... 141
Bakelite Corp. (Plastic Div.)..... 123
Baker Brothers, Inc..... —
Baldwin Locomotive Works..... 117
Bantam Bearing Div., The Torrington Co. ..... —
Barber-Colman Company 222
Bardwell & McAlister, Inc..... —
Barnes Co., W. F. & John..... —
Barnes-Gibson-Raymond Div., Associated Spring Co..... —
Battelle Memorial Institute..... 108
Bauer & Black Div., The Kendall Co. ..... —
Bay State Abrasive Prod. Co..... —
Bearings Co. of Amer..... —
Bell Telephone Laboratories..... —
Bendix Aviation Corporation
Bendix Products Div..... 115
Eclipse Machine Div..... —
Zenith Carburetor Div..... 187
Bendix-Westinghouse Automotive Air Brake Co..... 148
Berg Engineering Service..... 116
Bessemore Products Co..... —
Bethlehem Steel Company..... 170
Birdsboro Steel F'dry & Mach. Co. 164
Black Drill Co..... 144
Blakeslee & Co., G. S. 64
Blanchard Machine Co., The..... —
Bliss & Laughlin, Inc..... —
Borg & Beck Div. Borg-Warner... 48
Borg-Warner Corp. 71
Bower Roller Bearing Co..... —
Bowser, Inc. 162
Box 27 114
Brad Foote Gear Wks..... —
Bridgeport Fabrics, Inc..... —
Bridgeport Thermostat Co., Inc... 165
Bristol Co., The..... —
Brown-Line Gear Co..... —
Bruning Co., Inc., Chas..... 163
Bryant Chucking Grinder Co..... —
Buell Manufacturing Co..... 76
Buffalo Bolt Co..... —
Bullard Co., The..... —
Bulldog Electric Products Co..... —
Bundy Tubing Co..... 12

Bunting Brass & Bronze Co..... —
Burgess-Norton Mfg. Co..... —

Campbell, Andrew C., Div. Amer. Chain & Cable Co., Inc..... —
Campbell, Wyant & Cannon Foundry Co. ..... —
Carbide & Carbon Chemicals Corp. —
Carboloy Company, Inc..... —
Cardox Corp. ..... —
Carnegie-Illinois Steel Corp. 139
Carpenter Steel Co., The..... 61
Celanese Corp. of Amer..... 166
Central Equipment Co. 102
Central Screw Co..... —
Chace Co., W. M..... —
Chambersburg Engineering Co..... 219
Chandler Products Corp..... —
Chicago Drillet Corporation..... 212
Chicago Rawhide Mfg. Co..... 79
Chicago Screw Co., The 120
Chicago Show Printing Co..... —
Cincinnati Milling Machine Co..... —
Cincinnati Tool Co..... —
Circo Products Co..... —
Cities Service Oil Co..... 131
Clark Equipment Co..... —
Clark Tructractor Div..... —
Classified Advertisements 218
Clayton Manufacturing Co..... —
Clearing Machine Corporation.... 91
Cleveland Pneumatic Tool Co..... —
Cleveland Wire Spring Co..... 168
Clifford Mfg. Co..... —
Climax Molybdenum Company.... 35
Cold Medal Products Co., The.... 213
Columbia Steel Co. 139
Cone Automatic Machine Co., Inc.. —
Connecticut Telephone & Elec. Div. —
Consolidated Vultee Aircraft Corp. (Stinson Div.) 62-63
Continental-Diamond Fibre Co.... —
Continental Die Casting Corp..... 119
Continental Machines, Inc. (DoAll) —
Continental Motors Corp..... 145
Continental Rubber Works..... —
Continental Screw Co..... —
Cook Electric Company..... —
Corbin Screw Corp., The..... —
Cotta Transmission Corp..... —
Crane Packing Co..... 116
Crescent Truck Co..... —
Cullen-Friedstedt Co. ..... —
Cunningham Co., M. E..... 218
Curtis Pneumatic Mach'ry. Div... —
Curtis Universal Joint Co., Inc.... —

Danly Machine Specialties, Inc.... 110
Dardelet Threadlock Corp. ..... —
Davis & Thompson Co..... 108
Dearborn Gage Co..... —
Deepfreeze Div. Motor Products Corp. 155
De Luxe Products Corp..... —
Detrex Corporation 90
Detroit Gasket & Mfg. Co..... —
De Walt Products Corp..... —
Diamond Tool Company..... —
Disston & Sons, Inc., Henry..... 161
Ditzler Color Div..... —
Dole Valve Co., The..... 112
Donaldson Co., Inc..... —
Dow Chemical Co., The..... 43
Dravo Corporation ..... —
Drop Forging Assn..... —
Dugas Div. of Ansul Chemical Co. —
du Pont de Nemours & Co 77-171-191
Dykens Co., The..... —

Eastern Stainless Steel Corp..... —
Eaton Mfg. Co..... 149
Electric Auto-Lite Co..... —
Electric Furnace Co., The..... 74
Electric Sprayit Co..... —
Electrical Engineering & Mfg. Corp. ..... —
Electro Metallurgical Co..... —
Electro Products Laboratories.... —
Emerson Electric Mfg. Co., The.. —
Empire Electric Brake Co..... —
Equitable Bearing Co., Inc..... 56
Erie Malleable Iron Co..... —
Essex Wire Corp..... —
Ex-Cell-O Corporation ..... —

Fafnir Bearing Co..... —
Fairfield Mfg. Co..... —
Federal Machine & Welder Co...80-81
Federal-Mogul Corp. 158
Federal Press Co., The..... —
Federal Seal Co..... 118
Felters Co., The..... —
Filtors, Inc. ..... —
Fitchburg Grinding Machine Corp. —
Fitzgerald Mfg. Co., The..... 212

Flexotube Company ..... —
Foote Bros. Gear & Machine Corp. —
Ford Motor Co., Johansson Div... 78
Formica Insulation Co., The..... 147
Francis, Joseph F. 218
Fuelcharger Corporation ..... —
Fuller Manufacturing Co..... 152
Fulton Sylphon Co., The..... 57

G & O Mfg. Co..... —
Gabriel Company ..... —
Gairing Tool Co., The..... —
Galland-Henning Mfg. Co..... 118
Garrett Co., George K..... —
Gear Grinding Machine Co..... 153
General Aircraft Equipment Co... —
General Aniline & Film Corp..... —
General Controls 214
General Electric Company.....104-173
General Machinery Corp..... —
General Steel Warehouse Co., Inc. 120
Gibson Company, Wm. D..... —
Gisholt Machine Co. 6-211
Gits Bros. Mfg. Co..... —
Govro-Nelson Co. 219
Grammes & Sons, Inc., L. F..... —
Grand Specialties Co..... 219
Graton & Knight Co..... —
Gray-Mills Co. 60
Great Lakes Steel Corp..... 93
Greenlee Bros. & Co..... —
Grizzly Manufacturing Co..... 68
Gulberson Diesel Engine Co..... —
Gunite Foundries Corp..... —

Hall Mfg. Co., The..... —
Hammond Machinery Bldrs., Inc.. —
Handy & Harman..... —
Hansen Mfg. Co., The 97
Hanson-Van Winkle-Munning Co. —
Harnischfeger Corp. 120
Harper Co., The, H. M..... —
Harris Products Company..... 82
Harrisburg Steel Corp..... —
Hartwell Aviation Supply Co..... —
Harvey-Wells Electronics, Inc.... —
Hayes Industries, Inc..... 188
Heald Machine Co., The....2nd Cover
Hecker, A. W..... —
Hedstrom Corp., Oscar W..... —
Herbrand Corporation, The..... 70
Hercules Powder Company, Inc... 121
Hewitt Rubber Corp..... 160
Holley Carburetor Company..... 194
Holliston Mills, Inc., The..... —
Hooven, Owens, Rentschler Co.... —
Hoover Ball & Bearing Co..... —
Houde Engrg. Div..... —
Houdry Process Corp..... —
Houghton & Co., E. F..... 197
Howell Electric Motors Co..... —
Hyatt Bearings Div. G. M. Corp.. 7
Hycar Chemical Company..... 59
Hydraulic Machinery, Inc..... —
Hydraulic Press Mfg. Co., The.... 13
Hydropress, Inc. 126

Imperial Brass Mfg. Co., The..... —
Independent Engineering Co., Inc. —
Inland Mfg. Div. G. M. Corp..... —
Inland Steel Company..... 31
International Nickel Co., Inc., The —
International Plastic Corp. 101
International Screw Co..... —

Jack & Heintz, Inc.....88-89
Jacobs Co., F. L..... —
Jessop Steel Company..... 198
Johansson Div. Ford Motor Co.... 78
Johnson Bronze Co..... 189
Johnson Rubber Co..... —
Jones & Lamson Machine Co..... —
Jones & Laughlin Steel Corp..... 183

Index to

The Advertisers' Index is published of the advertising contract. Every rectly. No allowance will be made

Kearney & Trecker Corp..... —
Kempsmith Machine Co..... 192
Kent-Owens Machine Co..... —
Kester Solder Co..... —
Kiekhaefer Corporation ..... —
King-Seeley Corp. ..... —
Kling Bros. Engrg. Wks..... —
Knu-Vise, Inc. ..... —
Kold-Hold ..... —
Koppers Co. 95
Kropp Forge Aviation Co..... 125

Ladish Drop Forge Co..... —
Lake Erie Engrg. Co..... —
Lamb Electric Company..... 116
Laminated Shim Co., Inc..... —
Lamson & Sessions Co..... —
Landis Machine ..... —
Landis Tool Company..... —
Lapointe Machine Tool Co..... —
Layne & Bowler, Inc..... —
LeBlond Machine Tool Co., R. K.. —
Leeds & Northrup Co..... 66
LeMaire Tool & Mfg. Co..... —
Libbey-Owens-Ford Glass Co..... 179
Lincoln Electric Co., The..... —
Lincoln Engineering Company.... 177
Lincoln Park Industries, Inc..... 150
Lindberg Engineering Co..... —
Lipe Rollway Corp..... —
Lister-Blackstone, Inc. 52
Littell Machine Co., F. J. 120
Lodge & Shipley Mach. Tool Co... —
Logan Engineering Co..... —

New England Screw Co..... —
New Jersey Zinc Co., The..... 47
New Process Gear Co..... —
Niles Tool Works Co..... —
Nitralloy Corp., The 175
Norton Company ..... —
Nox-Rust Corporation 98

Oakite Products, Inc..... —
Ohio Crankshaft Co., The..... 193
Ohio Rubber Co., The..... 180
Oiljak Mfg. Co., Inc..... —
Olofsson Tool & Die Co..... —
Optimus Detergents Co..... —
Ozalid Div. General Aniline & Film Corp. ..... —

Page Steel & Wire Div. American Chain & Cable Co., Inc..... —
Palnut Co., The..... 84
Panelyte Div., St. Regis Paper Co. 208
Paris Pressed Steel Co..... —
Parker Appliance Co..... —
Parker Co., The Charles..... —
Parker-Kalon Corp. ..... —
Parker Rust Proof Co..... —
Pawtucket Screw Co..... —
Pedrick Piston Rings..... 105
Peerless Machine Co..... —
Peninsular Grinding Wheel Co.... —
Pennsylvania Salt Mfg. Co..... 83
Perfex Gage & Tool Co..... —
Permatex Co., Inc..... 39
Permold Company, The..... —
Pesco Products Co..... 65
Pheoll Mfg. Co..... —
Phillips Screw Mfrs..... —
Photoswitch, Inc. ..... —
Physicists Research Company.... —
Pierce Governor Co., Inc., The.... —
Pierce Paper Products Co. 120
Pittsburgh Lectromelt Furnace Corp. ..... —
Pittsburgh Steel Co..... 113
Pollak Mfg. Co..... —
Porter-Cable Machine Co..... —
Potter & Johnston Machine Co... 218
Poulsen & Nardon, Inc..... 176
Pratt & Whitney (Division Niles-Bement-Pond Co.) 124
Precise Products Company..... —
Preis Engraving Mach. Co., H. P. —
Progressive Mfg. Co., The..... 217
Progressive Welder Co..... —
Purolator Products, Inc..... —

Radiator Specialty Co..... —
Ramsey Access. Mfg. Corp. ..... —
Reading Screw Co..... —
Reeves Bros., Inc..... 178
Redmond Co., A. G..... —
Refiners Lubricating Co..... —
Republic Steel Corp.....72-73
Resistoflex Corporation 128
Revere Copper & Brass, Inc..... 142
Reynolds Metals Company...54-55-195
Rockford Clutch Div..... 92
Rockford Die & Tool Works, Inc.. —
Rockford Machine Tool Co..... 181
Rodic Rubber Corporation..... 174
Rohm & Haas Co..... 135
Ruby Chemical Co..... —
Russell, Burdsall & Ward Bolt & Nut Co. ..... —
Ryerson & Son, Inc., Joseph T..... 2

SKF Industries, Inc..... —
Saginaw Malleable Iron Div. G. M. —
Saginaw Steering Gear Div..... —
Salisbury Axle ..... —
Scandia Mfg. Co..... —
Schrader's Son, A..... —
Schwitzer-Cummins Co..... 111
Sciaky Bros. 116
Scovill Manufacturing Co. (Waterville Div.) ..... —
Scully-Jones & Co..... 209
Sealed Power Corporation..... 45
Seneca Falls Machine Co..... —
Service Caster & Truck Div..... 210
Service Spring Co. 118
Shakeproof, Inc. 53
Sheffield Corp., The..... 143
Sheldon Machine Co., Inc..... —
Sherwin-Williams Co., The..... —
Shore Instrument & Mfg. Co., The —
Sifuler Axle Co., Inc..... —
Sibley Machine & Fdry. Corp..... 215
Silent Hoist & Crane Co..... —
Simmonds Aerocessories, Inc..... —
Simplex Products Corp..... 217
SisalKraft Co., The..... 214
Snap-On Tools Corporation..... —
Snyder Tool & Engrg. Company.. 182
Southington Hardware Mfg. Co... —
Speer Carbon Co..... 213
Spencer Turbine Co., The..... —

Sperry Products, Inc..... —
Spicer Mfg. Co..... —
Sponge Rubber Prod. Co..... —
Spun Steel Corporation, The..... 203
Standard Molding Corporation.... 184
Standard Oil Co. (Ind.)..... —
Standard Products Co..... —
Stensgaard & Asso., Inc., W. L... 216
Sterling Aluminum Products, Inc. 110
Stinson Div. Consolidated Vultee Aircraft Corp. 62-63
Stow Manufacturing Co..... —
Strom Steel Ball Co..... —

Stuart Oil Co., Ltd., D. A..... —
Sun Oil Company..... —
Superior Steel Corporation..... —

Tannewitz Works, The 86
Taylor Fibre Company..... —
Teleoptic Co. ..... —
Tennessee Coal, Iron & Railroad Co. ..... —
Texas Co., The..... 8-9
Thompson-Bremer & Co....3rd Cover
Timken Roller Bearing Co., The Front Cover
Tinnerman Products, Inc..... 216
Titeflex, Inc. ..... —
Toledo Scale Co..... —
Tomkins-Johnson Co. ..... —
Torrington Co., The..... —
Tourek Mfg. Co., J. J..... 196
Transue & Williams Steel Forging Corp. ..... —
Trico Products Corporation..... 201
Trimount Instrument Company... 218
Tube-Turns, Inc. ..... —
Tung-Sol Lamp Works, Inc..... —
Turner Gauge Grinding Co..... —
Tuthill Pump Company..... 216
Tuthill Spring Co..... —
Twin Disc Clutch Company..... 14

U. S. Automatic Corporation..... 104
Udylite Corp., The..... —
Union Carbide & Carbon Corp. 123
Union Drawn Steel Div. 72-73
Union Steel Products Co..... —
Unit Crane & Shovel Corp..... 114
United Screw & Bolt Corp..... —
United Specialties Company..... 118
United States Steel Corp..... 139
United States Tool & Mfg. Co..... —

Van der Horst Corp. of Amer..... 122
Vascoloy Ramet Corp..... 114
Vickers, Inc. 85
Victor Mfg. & Gasket Co..... 51
Vinco Corporation 132

Wadsworth Watch Case Co., Inc.. 215
Waldes-Koh-I-Noor, Inc. 137
Walker-Turner Co., Inc. 202
Ward Products Corporation, The. —
Warner Electric Brake Mfg. Co... —
Watson-Stillman Co., The..... 200
Waukesha Motor Co..... 1
Waverly Petroleum Prod. Co..... —
Weatherhead Co., The..... —
Wedge Protector, Inc..... —
Wellman, S. K..... —
Wellman Bronze & Alum. Co., The —
Wells Mfg. Corp..... 204
West Disinfecting Co..... —
Western Auto. Mach. Screw Co... 67
Western Felt Works 138
Westinghouse Electric Corp., Back Cover
Whistler & Sons, Inc., S. B..... 134
Whitaker Cable Corporation..... 205
White Dental Mfg. Co., The S. S.. 185
Whitney Metal Tool Company.... 216
Whitney Screw Corp..... —
Whittaker Co., Ltd., Wm. R..... 210
Wico Electric Co..... —
Wilcox Rich Div. (Eaton Mfg. Co.) 149
Wilkening Mfg. Co..... 105
Williams & Co., J. H..... —
Wilson Co., The H. A..... 186
Witco Chemical Co..... 206
Wittek Mfg. Co..... 207
Wolverine Tube Div..... 136
Wood Co., R. D..... —
Woodworth Co., N. A..... —
Worcester Stamped Metal Co..... 116
Wright Mfg. Div. American Chain & Cable Co..... 154
Wrigley, Jr., Co., Wm..... —
Wrought Washer Mfg. Co..... —
Wyman-Gordon 100
Wyzenbeek & Staff, Inc..... —

Yankee Metal Products Corp..... 114
Yoder Co., The..... —
Young Radiator Co..... 3

Zollner Machine Works..... —

Advertisers

as a convenience, and not as part care will be taken to index cor- for errors or failure to insert.

Long Mfg. Div. Borg-Warner Corp. 107
Lubri-Gas Laboratories..... 94
Lubriplate Div. Fiske Bros. Refining Co. ..... —

McAleer Manufacturing Co..... 129
Magnaflux Corp. 169
Mahon Co., R. C., The..... —
Mallory & Co., Inc., P. R..... 146
Manhattan Rubber Mfg. Div..... 219
Manufacturers Screw Products... —
Marman Products Co., Inc..... 133
Marvel-Schebler Carburetor Div. Borg-Warner 167
Mechanics Universal Joint Division Borg-Warner Corp..... 108
Mercury Aircraft, Inc..... 217
Merrill Engineering Lab..... —
Merz Engineering Company..... 212
Metal Specialty Co., The..... —
Michigan Leather Products Co.... —
Michigan Steel Tube Prod. Co..... 69
Michigan Tool Company..... —
Micromatic Hone Corp.....10-11
Midland Steel Products Co..... 190
Mid-States Equipment Co..... 217
Milford Rivet & Machine Co..... —
Millholland Machry. Co., W. K.... 112
Milwaukee Sadlery Co..... —
Moline Tool Company..... —
Monroe Auto Equip. Co..... —
Moraine Products Div. G. M..... 157
Morse Chain Company..... —
Motor Products Corporation..... 155
Motor State Products Company... —
Muehlhausen Spring Corp..... 16
Muskegon Piston Ring Co..... 5
Mystik Adhesive Prod. Division Chicago Show Printing Co..... —

National Acme Co., The..... 172
National Broach & Machine Co.... 99
National Lock Washer Co..... 87
National Screw & Mfg. Co., The.. 109
National Steel Corp. 93
Nelson Specialty Welding Equip. Corp. ..... —
New Britain Machine Co..... 49
New Departure Div. G. M. Corp... —

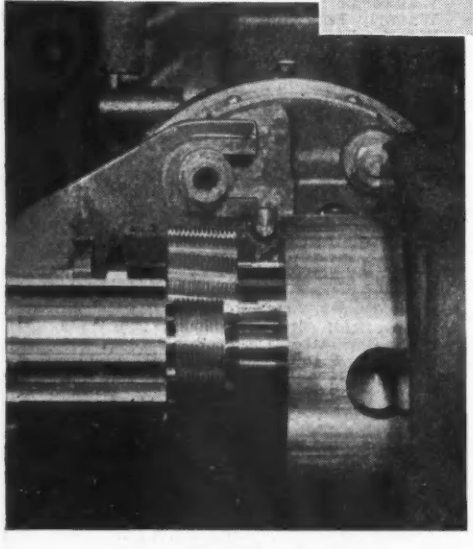
BARBER-COLMAN

HOBS • HOBBING MACHINES • HOB SHARPENING MACHINES • MILLING CUTTERS
REAMERS • REAMER SHARPENING MACHINES • SPECIAL TOOLS

UNGROUND

THREAD MILLING CUTTER HOLDS CLASS III LIMITS IN VERY TOUGH MATERIAL

100 PIECES PER SHARPENING!



Barber-Colman UNGROUND Thread Mills are exceptionally accurate, in spite of the fact that the tooth profiles are not ground after hardening. This fact is achieved through specialized production methods, particularly in the heat-treatment, used by Barber-Colman to maintain specified cutter dimensions. A typical example of cutter results is shown, on which 12-pitch threads, 1¼″ diameter by 1″ long, are milled to Class III limits on a production basis. The material is heat-treated NE 9445 steel with a Rockwell C hardness of 33-37. Surface speed of cutters is 105 feet per min., with a feed of 3.28″ per min. giving a floor-to-floor production time of 5 minutes per piece. Pitch diameter is held within .0015″. Even in this tough material these UNGROUND cutters produce 100 pieces per sharpening. *Investigate Barber-Colman UNGROUND Cutters for your production jobs!* Write for Copy of Facts About Multiple Thread Milling Cutters.

Barber-Colman Company

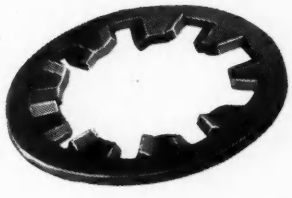
GENERAL OFFICES AND PLANT 107 LOOMIS ST., ROCKFORD, ILLINOIS

MANY WIDE CHISEL EDGES

give your assemblies

Unmatched STAYING POWER

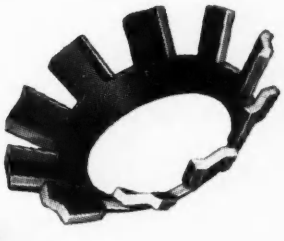
4 Standard Types Meet Most Lock Washer Needs

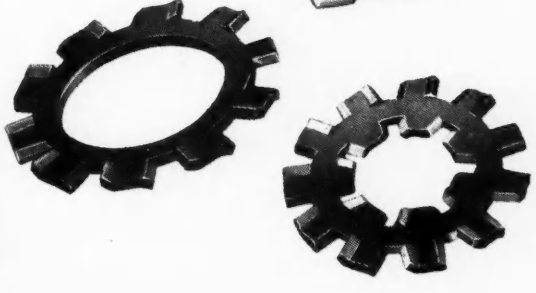


Just as a chisel braces more strongly than an ice pick... so EverLock Washers provide the extra *gripping area* needed to resist extreme strain, vibration, expansion or contraction. The multiple teeth grip the nut and work with the full width of their distinctive chisel edges. Full use of this added area of resistance is assured by powerful spring tension which drives each chisel edge into positive locking action.

Take advantage of this double locking action to give your assemblies the edge in their battle against shocks, impacts, vibration and wear.

Wire, phone or mail your orders today.

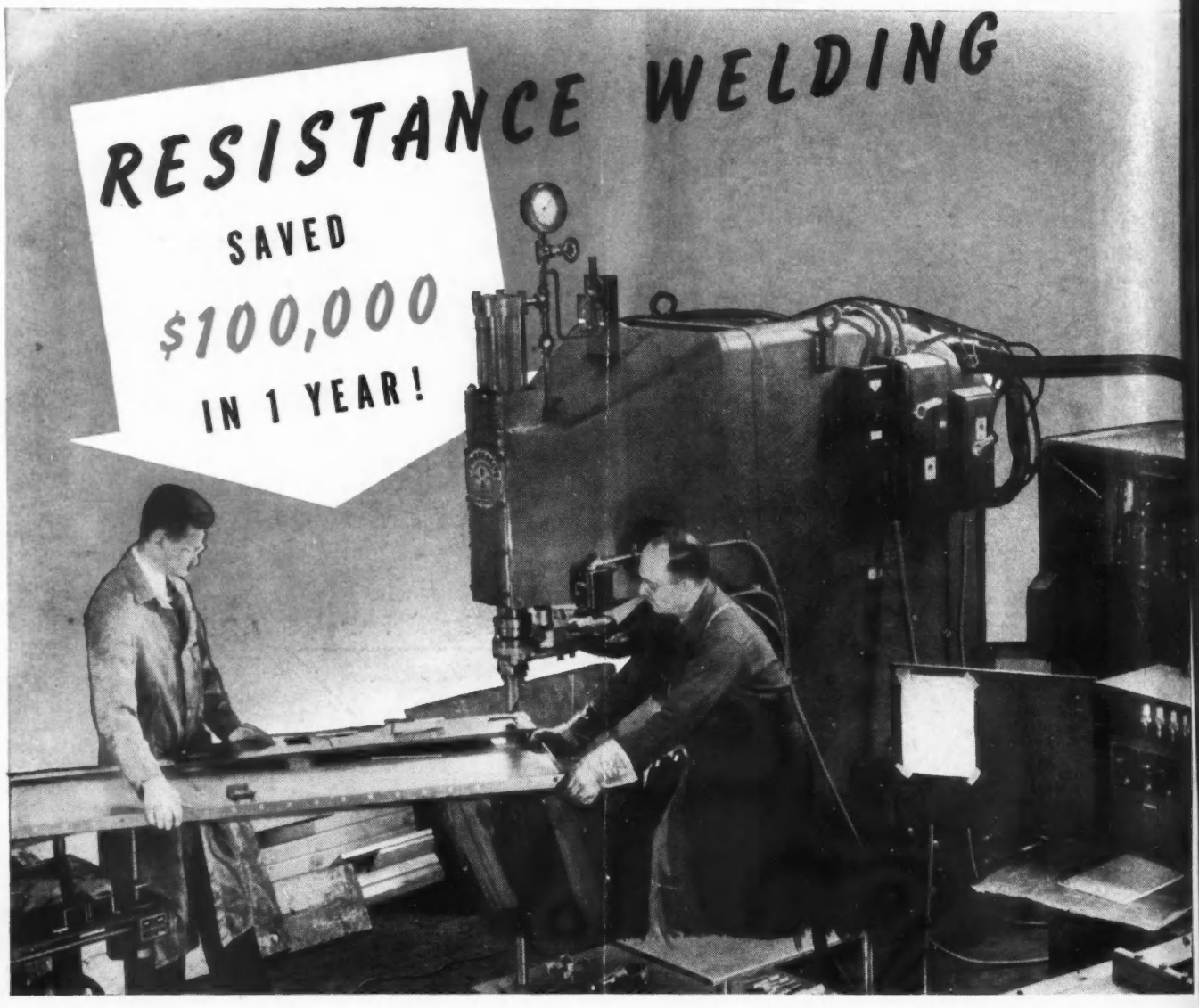




EverLOCK WASHERS

THE WASHER THAT HAS THE EDGE

THOMPSON-BREMER & CO., 1642 W. HUBBARD ST., CHICAGO 22, ILL.



Building cabinets with resistance welding lowered gauge requirements, maintained strength and tolerances. Lighter stock permitted planned shearing that reduced scrap losses.

Here's saving with a capital $ . . . resistance welding made it possible to save $100,000 in one year for a manufacturer of metal cabinets!

Used to replace other forms of fabrications, resistance welding slashed the cost of the cabinet by more than 66%, saving 600 tons of steel, 10,000 man-hours of labor and 3,000 pounds of welding rod . . . a total dollar value of $100,000.

Westinghouse precision electronic control of weld time, heat control and sequencing of the resistance welders on this job helped make these remarkable savings possible.

This case history is typical of the amazing versatility and efficiency of resistance welding as a production tool for metal fabrication. Your nearest Westinghouse office can give you complete details on Westinghouse resistance welding controls and their applications . . . how they cut costs, speed production, save time. Or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

J-21332

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Electronics at Work

elding
ar for

esist-
more
hours
total

weld
tance
kable

ersa-
pro-
arest
etails
and
peed
ctric
enn-

-21332